

## Chapter 3

# AFFECTED ENVIRONMENT

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### Introduction

This chapter will discuss the affected environment of the resources potentially affected by Reclamation's proposed action. These resources, in order of discussion, include vegetation, fish, wildlife, threatened, endangered, and special status species, economics, recreation, irrigated agriculture, historic resources, traditional cultural properties, Indian trust assets, environmental justice, surface water quality, groundwater quality, Native American sacred sites, visual quality, air quality, soils, and the social environment. Chapter 4 will analyze the environmental impacts of the Action Alternative to these resources, compared to the condition of the resources under the No Action Alternative.

Reclamation recently completed an environmental assessment (EA) and finding of no significant impact for the Banks Lake Resource Management Plan. The EA includes information on natural resources such as endangered species, soils, vegetation, cultural resources, recreation use, and Indian trust assets. The information on these resources contained in the EA is incorporated by reference into this draft EIS.

### Vegetation, Fish, and Wildlife

#### Background

The littoral zone of Banks Lake extends from the shore just above the influence of waves and spray to a depth where the light is barely sufficient for rooted aquatic plants to grow (Goldman and Horne 1983). This biologically critical zone supports aquatic emergent vegetation (primarily cattails, bulrush, and sedges) that provide spawning habitat and nursery areas for the majority of Banks Lake's fish species; provides food and cover for waterfowl, mammals, and amphibians; and supports cottonwood trees important for perch sites for bald eagles and other raptors. This zone is the focus of analysis of impacts to vegetation, fish, and wildlife for the proposed August drawdown alternative.

Water levels not only determine the extent of littoral habitat, but affect that habitat when fluctuations occur (Hoyer and Canfield 1997; Ploskey 1986). Several recent studies on littoral zone habitats in lakes have documented decreases in total cover and changes in substrate composition with decreases in water level as small as 0.6 m (2 ft) (Irwin and Noble 1996). Beauchamp et al. (1992) estimated that 20 percent of rocky substrate, important as cover for small native fishes was exposed during a drought that lowered Lake Tahoe's water level by 2 m. Dibble (1993) found that bass populations were adversely affected by water level declines that dewatered shallow water gravel substrates which supported high densities of age-0 largemouth bass (less than 1 yr old).

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The surface area and shape of a lake significantly influences the effect wind can have on wave size and current strength. Large lakes tend to have larger fetches (area open to the prevailing wind) and thus have greater wave and current energy than lakes with small surface areas. Wave action and currents erode a terrace along the shoreline, leaving coarse material in shallow water and depositing finer materials in deep water. The direction and strength of the wind, slope, and shape of the lake basin determine where the substrates will move. Generally, points and shallows where wind and wave energy are highest tend to be swept clean. Bays and deep areas in a lake tend to fill with sediment. The variation in the quantity and quality of silt largely controls the distribution of submersed vegetation. Large lakes with many bays or coves may develop an extensive littoral zone, because these areas are protected from strong waves and currents. Thus, basin size, shape, and depth determine, to a large degree, the distribution of sediments in a lake and, therefore, the distribution of aquatic plants. Additionally, a gently sloping littoral zone allows the deposition of fine sediments that promote plant growth. Steeply sloped littoral zones are areas of erosion and sediment transport and are not suitable for plant growth.

There are three distinct habitat types at Banks Lake. (1) Bays and shoreline areas, which are sheltered from much of the wind and wave action, have a well developed community of aquatic emergent vegetation species such as bulrushes, sedges, and cattails. (2) Main lake habitats subject to wind and wave action include extensive shorelines composed of sand, gravel, and cobble; and medium to hard-packed clay. (3) Uplands, which are not affected by changes in water level and which will not be addressed.

A vast body of scientific literature is available on the effects of reservoir drawdowns. This analysis draws upon the knowledge gained at many other reservoir projects to develop a better understanding of the present conditions and anticipated impacts resulting from an August drawdown. The analysis of impacts focuses on the littoral zone of the lake, as well as on the productivity of the open water in the form of zooplankton.

## **Vegetation**

Two major vegetation communities that exist within the littoral zone may be affected by late summer drawdowns: (1) aquatic emergents in shallow low gradient bays and shorelines; and (2) the narrow strip of riparian vegetation that exists just above the high-water line along some portions of Banks Lake.

In the semi-arid and arid portions of the West water availability to plants from rain and snowmelt infiltration are limited, sporadic, and unreliable. Riparian and emergent vegetation has adapted to these harsh conditions by drawing much of their seasonal water needs from comparably reliable groundwater sources (Stromberg 1994; Mahoney and Rood 1991). Any significant change in groundwater elevation during the growing season has the potential to adversely affect these vegetation communities (Stromberg 1992). Mortality or even stress in these species will lead to changes in vegetation community composition.



**Figure 3-1.**—Aquatic emergent vegetation is common in Banks Lake in coves, bays and shorelines protected from wind and wave action. It provides food and cover for many species of fish and wildlife.

Many species of riparian vegetation, especially cottonwood, have very specific soil moisture requirements needed for germination and seedling survival. These requirements typically involve early spring high water levels that recede just prior to seed fall, providing a moist seedbed. Any significant alteration of the timing or magnitude of water levels can adversely affect germination and seedling survival (Bradley and Smith 1986; Stromberg 1992) and can have long term effects on these species.

**Aquatic Emergent Vegetation.**—Banks Lake full pool is elevation 1570 feet. Water levels fluctuate approximately 3 to 5 feet annually with the highest water levels typically in June and the lowest levels in November. This relatively stable water regime has allowed the development of aquatic emergent plants in all available protected bays and shorelines. Shallow, marshy areas in bays and along low gradient shorelines occur in only a few areas, but are extremely important to fish and wildlife (fig. 3-1). Aquatic emergent vegetation provides sheltered nutrient-rich spawning and nursery habitat for many of Banks Lake fish species as well as waterfowl nesting and foraging. This habitat type is found primarily in Barker Cove, Osborn Bay, Kruks Bay, Jones Bay, Airport Bay, and Devil's Punch Bowl, and

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along shorelines in the southwest corner of Banks Lake adjacent to the Dry Falls Dam (fig. 3-2 and 3-3).

Stands of aquatic emergent vegetation occur in protected bays and shorelines with a gentle slope. Dominant species include reed canarygrass (*Phalaris arundinaceae*), and Baltic rush (*Juncus balticus*). Lesser amounts of other aquatic emergents exist, including American bulrush (*Scirpus americanus*), Nebraska sedge (*Carex nebrascensis*), spike rush (*Eleocharis palustris*), common cattail (*Typha angustifolia*), red top bentgrass (*Argostis alba*), lesser duckweed (*Lemna minor*), sago pondweed (*Potamogeton pectinatus*), and Eurasian water milfoil.

Aquatic emergent plants are found in shallow coves (<2-m depths) well protected from winds and wave action, preferably with gradual slopes. A fine-textured substrate is preferred and generally indicates a favorable, low-energy environment. Unfavorable abiotic conditions include excessive water-level fluctuations, high turbidities, and shifting sediments. Small, young plants are especially vulnerable to changing water levels that may place them in water too deep or muddy to allow for adequate light penetration or so shallow as to expose them to turbulence or desiccation or cover them with sediment (Smart and Dick 1999). The ability to tolerate periodic drawdown and drying will determine which emergent plant species would be able to survive. Ten representative aquatic emergent plant species that occur or potentially occur at Banks Lake have been selected for detailed analysis. Table 3-1 summarizes the drought tolerance and the species value for fish and wildlife for these species.

**Riparian Vegetation.**—The riparian vegetation along the shoreline of Banks Lake is dominated by black cottonwood (*Populus balsamifera*), Russian olive (*Elaeagnus angustifolia*), willow (*Salix* spp.), and Wood's rose (*Rosa woodsii*), with lesser amounts of red-osier dogwood (*Cornus sericea*). Shoreline erosion is degrading many shoreline riparian areas or preventing their establishment and development. In some areas, persistent erosion is undercutting the banks and roots of mature riparian cottonwood and willow trees, causing them to fall over (figure 3-4). Land use activities such as livestock grazing, dispersed recreation, and motor vehicle travel have accentuated the erosion problem and contribute to the lack of riparian vegetation and ground cover in many shoreline area.

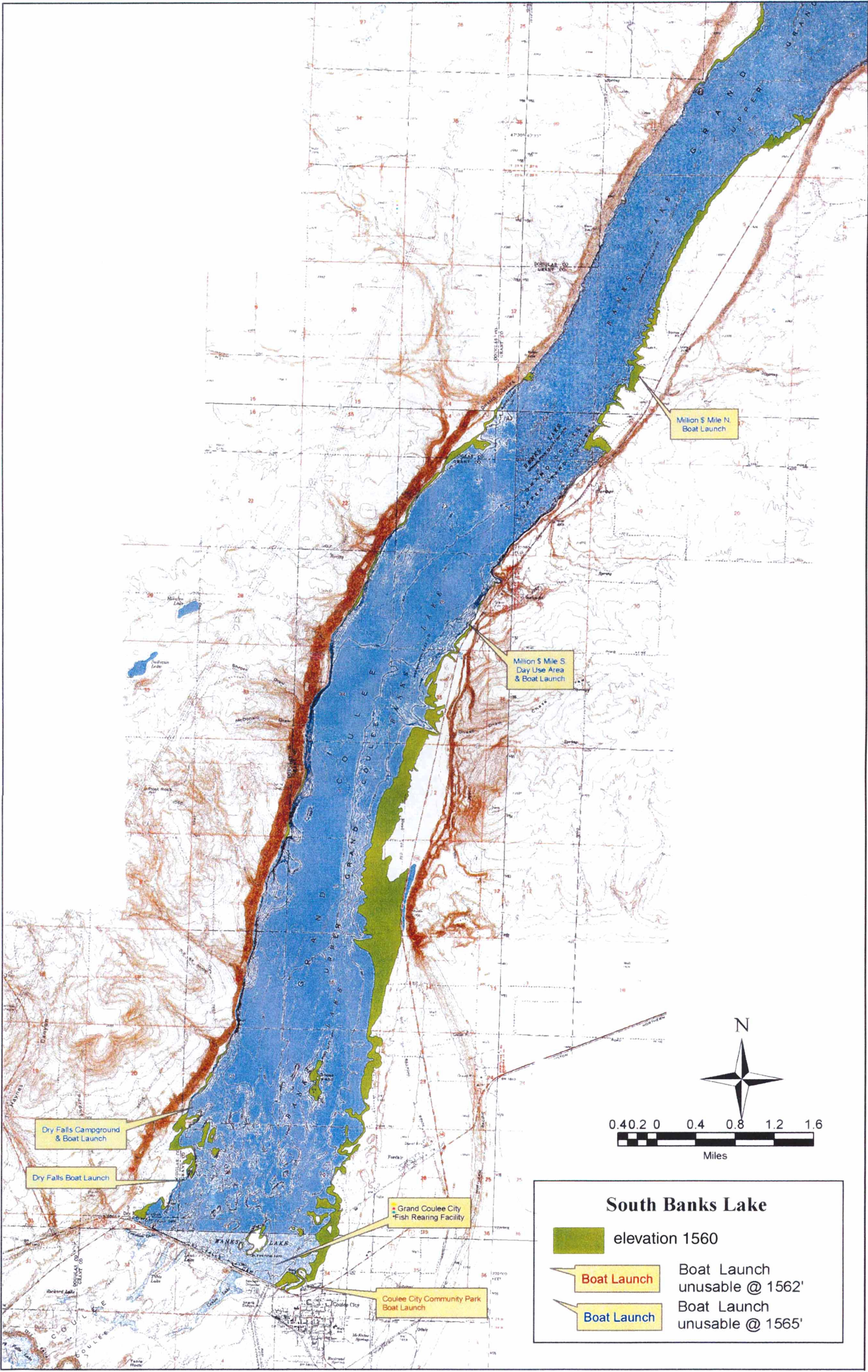
The drought tolerance of six riparian species that could occur at Banks Lake is summarized in table 3-2. The value for wildlife is also summarized.





Figure 3-2.—North Banks Lake.





**South Banks Lake**

elevation 1560

Boat Launch Boat Launch unusable @ 1562'

Boat Launch Boat Launch unusable @ 1565'

Figure 3-3.—South Banks Lake.



**Table 3-1.**—Drawdown tolerance for representative aquatic emergent plant species characteristic of the habitat at Banks Lake.

Data from NRCS 2000; U.S. Forest Service, *Forest Service plant database*, 2000; U.S. Forest Service, *Umatilla National Forest...*, 2000; Hitchcock and Cronquist 1973; Bentrup and Hoag 1998; Reclamation, *Vegetation Observed...*, 2001.

Species	Drought Tolerance	Fish/Wildlife Value
Reed canarygrass	Tolerant of frequent and prolonged flooding and submergence and is moderately tolerant of drought.	Waterfowl, upland game birds, riparian mammals, and fish use it for cover and food.
Baltic rush	Tolerates both dry and a wide range of hydrologic conditions.	Important nesting, hiding, and feeding cover for birds and mammals.
American bulrush	Best survival and growth occurs where average minimum yearly water levels do not fall below 2 to 4 inches above the soil surface.	Important food for waterfowl.
Nebraska sedge	Prefers soils saturated early in the season that later dry out.	Good food for waterfowl, cover for waterfowl and small mammals.
Common spikerush	Thrives in shallow wetlands that get flooded by spring runoff then slowly dry up during summer.	Important food and cover for waterfowl. Provides cover for small birds and mammals.
Common cattail	Tolerant of continuous inundation and seasonal drawdowns.	Considered an undesirable weed in marshes managed for ducks. Provides nesting sites for red-winged and yellow-headed blackbirds.
Redtop bentgrass	Found in shallow shoreline fringes and terraces adjacent to shoreline. Adapted to wet, poorly drained conditions; drought intolerant.	Provides food and cover for birds.
Lesser duckweed	Obligate wetland plant.	High value for waterfowl and shorebird food.
Sago pondweed	Obligate wetland species.	Very high value for waterfowl and shorebird food.
Eurasian water milfoil	Obligate wetland species.	Little value to wildlife or fisheries.

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**Table 3-2.**—Drought tolerance of riparian species (U.S. Forest Service, *Forest Service plant database*, 2000; U.S. Forest Service, *Umatilla National Forest...*, 2000; NRCS 2000).

Species	Drought Tolerance	Wildlife Value
Black cottonwood	Tolerates some summer drought when established. Has shallow root system.	Important for cavity nesters, daytime perch for bald eagles. Leaves and young shoots browsed by deer and elk, and birds feed on buds, flowers and seeds
Russian olive	Highly drought tolerant. It is an exotic.	Seeds eaten by a variety of birds and mammals.
Peachleaf willow ( <i>S. amygdaloides</i> )	Low drought tolerance. Occurs on transitional riparian sites.	Provides cover for mammals and birds. It is a preferred food of beavers.
Coyote willow ( <i>S. exigua</i> )	Low to medium drought tolerance. Occurs in the bank zone, overbank zone, and transitional zone in riparian areas.	Browsed heavily by elk. Provides cover for mammals and birds.
Red-osier dogwood	Medium drought tolerance	Used as food and cover by mammals and birds.
Wood's rose	Low to high drought tolerance.	Food for many species of wildlife.

## Fish

**Banks Lake Fish Assemblage.**—Through the years, WDFW has planted several fish species, including, but not limited to, rainbow trout (*Oncorhynchus mykiss*), kokanee (*Onocorhynchus perka Kennerlyi*), smallmouth bass (*Micropterus dolomieu*), coho salmon (*Lota lota kisutch*), and chinook salmon (*O. tshawytscha*). Most of the species present in Banks Lake either were pumped in from FDR Lake on the Columbia River or were found in the small lakes of the upper Grand Coulee prior to inundation. Creel surveys from the 1950s indicate kokanee, burbot, and possibly rainbow and eastern brook trout (*Salvelinus fontinalis*) were pumped in with irrigation water from FDR Lake (Duff 1973). Eastern brook trout failed to establish a reproducing population and disappeared from catch and gill net survey data.

Extreme drawdown during game fish spawning was a subject of concern for the RMP/EA. Several studies were conducted during the 1970s in Banks Lake to determine the effects of drawdown on the kokanee and yellow perch (*Perca flavescens*) spawning, egg incubation, and fry emergence (Stober 1976 and Thomas 1978). The studies concluded that low recruitment of kokanee year classes exposed to drawdown was a factor in reducing their abundance.

However, with the exception of maintenance and weed control programs in recent years, drawdowns during the 1980s and 1990s have been less severe than they were during the 1960s and 1970s.

Information on the status and management of Banks Lake fish species is provided in the Banks Lake RMP/EA incorporated by reference in this document, as well as in the Fish and Wildlife Coordination Act Report (see app. A). Important characteristics of several fish species that occur in Banks Lake are summarized in table 3-3.



**Figure 3-4.**—Eroding banks threaten a mature cottonwood near the Million Dollar Mile South Boat Ramp.

### Spawning and Nursery Habitat.—

*Shallow Emergent Vegetation.*—The presence of aquatic macrophytes provides refuge for prey species and interferes with the feeding of some predator species. Exposure to predators strongly determines small fish feeding behavior. If they are relatively safe from predators, they can forage more effectively. For large predators, the visual barriers of plant stems decrease foraging efficiency; hence, growth declines as habitats become more complex (Colle and Shireman 1980).

Reproductive success of fish that spawn near the shore in reservoirs is influenced by the time and duration of flooding and the type of substrate inundated (Aggus 1979). Water levels determine the amount of nursery area available by inundating or receding from vegetation. Survival of young fish of many species is increased when cover is abundant. Lack of habitat exposes young-of-year fish to increased predation. The density of young-of-year largemouth bass



**Table 3-3.**—Characteristics of several fish species present in Banks Lake (data from Scott and Crossman, 1973; Wydoski and Whitney, 1979; Simpson and Wallace 1982; and Pflieger 1997).

Family/ Species	Adult Habitat	Spawning Substrate	Spawning Depth	Spawning Dates	Spawning/Reproductive Characteristics	Food of young-of-year fish
<b>GAME SPECIES - <i>Ictaluridae</i> - Catfishes</b>						
Channel Catfish	Cool, clear, deeper water with sand, gravel, or rubble bottoms. Feeds in shallow water at night, returning to deep holes or cover during day.	Holes, undercut banks, logs, rocks	relatively shallow	late spring or summer	Newly hatched fish have large yolks and remain on bottom 2-5 days then swim to surface and begin to feed. Young fish remain in shallow water. Survival of young increases in turbid water.	Diptera, also caddisflies and mayflies
Brown Bullhead	Deeper water along shoreline, move into shallow, weedy areas to feed and spawn. Prefer shallow bays.	Mud, sand, or roots of aquatic vegetation near rocks, stumps, debris	as shallow as 6 inches	April through June	Newly hatched fish have large yolks and remain on bottom about 7 days, then begin to swim and feed actively. Young form a loose sphere and are shepherded about for several weeks by one or both parents until they are about 2 inches, then disperse.	Zooplankton and dipteran larvae initially, switching to midges, mayflies, worms, crustaceans, fish larvae, and eggs.
<b>GAME SPECIES - <i>Centrarchidae</i> - Sunfishes</b>						
Large-mouth Bass	Shallow areas with rooted aquatic vegetation with brush, logs, or other cover	Sand gravel or rubble	1-4 inches	mid-May to end of June	Young remain in bottom of nest until yolk is absorbed, then rise to begin feeding and schooling. After dispersal from nest, small to medium individuals form small schools and cruise shorelines while feeding.	Zooplankton and dipteran larva initially then insects and fish.
Small-mouth Bass	Rocky reefs and gravel bars.	Sand, gravel, rocks near logs, rocks, or vegetation.	2-20 inches	Late May to early July	After hatching, yolk sac is absorbed in 5-7 days, and young rise off bottom of nest. Male guards young several days until dispersal.	Zooplankton initially, switching to insects and fish.

**Table 3-3.**—Characteristics of several fish species present in Banks Lake (data from Scott and Crossman, 1973; Wydoski and Whitney, 1979; Simpson and Wallace 1982; and Pflieger 1997). (continued).

Family/ Species	Adult Habitat	Spawning Substrate	Spawning Depth	Spawning Dates	Spawning/Reproductive Characteristics	Food of young-of-year fish
GAME SPECIES - <i>Percidae</i> - Perches						
Walleye	Returns to shallows of main lake in April after spring spawning migration. In summer moves to deep, cooler water during the day, feeding in shallows at dusk. Holds in deep waters in winter.	Rubble, gravel, bedrock, rocky shoals--sometimes on sand or silt.	Shallow water	April	Eggs are broadcast and fall into crevices in rocky substrate. Yolk sac is absorbed rapidly and feeding takes place prior to disappearance of yolk. Young disperse 10-15 days after hatching to upper levels of open water. By end of summer, young move toward the bottom in 10-30 feet of water.	Zooplankton and fish. Highly cannibalistic if other food not available.
Yellow Perch	Seasonal movements follow the 68 °F isotherm. Very adaptable and able to use a wide variety of habitats.	Sand, gravel, rubble, vegetation, and brush	Shallow water near shore	April or May	No nest; eggs deposited in a ribbonlike gelatinous mass near vegetation or submerged brush or over sand, gravel or rubble. Young move from shallow water to deeper water in late fall. Young and adults are preyed on by almost all other predatory fishes and other yellow perch.	Cladocerans, ostracods, and chironomid larvae.
GAME SPECIES - <i>Salmonidae</i> - Trouts, whitefishes						
Rainbow Trout	In lakes prefer temps < 70 °F. Move to deeper water if oxygen content is adequate.	Unable to establish reproducing populations in Banks Lake.	Spawning usually occurs over fine gravel in a riffle.	Feb. to June. Some stocks fall spawners.	In lakes, spawning occurs in tributary streams.	Aquatic insects, worms, fish eggs.
Mt. Whitefish	Tend to frequent upper 15-20 feet of lake	Gravel shoals along lake shorelines	5 inches to 4 feet	October to December	Eggs deposited in late October, hatch in early March.	Plankton, midge larvae.

**Table 3-3.**—Characteristics of several fish species present in Banks Lake (data from Scott and Crossman, 1973; Wydoski and Whitney, 1979; Simpson and Wallace 1982; and Pflieger 1997). (continued).

Family/ Species	Adult Habitat	Spawning Substrate	Spawning Depth	Spawning Dates	Spawning/Reproductive Characteristics	Food of young-of-year fish
NONGAME SPECIES - <i>Cyprinidae</i> - Minnows						
Northern Pike-minnow	In spring and summer, adults in shallows. During fall and winter, move offshore into deeper water.	Gravel beaches	Shallows	Late May through July	Eggs are broadcast on gravelly beaches along shoreline. Young found in < 1-ft deep water along rubble or gravel shores. In summer, moved in to water about 3 ft deep with submerged vegetation.	Small aquatic and terrestrial insects becoming more piscivorous with increasing size.
Carp	Quiet water in dense vegetation	Submerged weeds, grasses, roots	3-4 inches to < 4 ft	Late spring - early summer	Yolk sac absorbed within a few days after hatching and fry form large schools in shallow water. Young move into deeper water as they grow.	Zooplankton initially, then add aquatic plants, insects, clams.
NONGAME SPECIES - <i>Catostomidae</i> - Suckers						
Long-nose Sucker	Lake bottoms to 80 ft	Gravel	Shallow gravel areas in lakes and streams.	Mid-April to mid-May	No nest is built. Eggs adhere to gravel and substrate. Young may remain in gravel for 1-2 weeks before moving away from spawning area. Young remain in shallow weedy areas. Young probably preyed on by wide variety of piscivorous fish and birds.	Zooplankton, aquatic insect larvae, and plants.

**Table 3-3.**—Characteristics of several fish species present in Banks Lake (data from Scott and Crossman, 1973; Wydoski and Whitney, 1979; Simpson and Wallace 1982; and Pflieger 1997). (continued).

Family/ Species	Adult Habitat	Spawning Substrate	Spawning Depth	Spawning Dates	Spawning/Reproductive Characteristics	Food of young-of-year fish
Large-scale Sucker	Backwaters and shallows of lakes on the bottom, but can be as deep as 80 ft	In lakes on gravelly or sandy shoals and shorelines	8 inches	April or May	Fry remain in gravel or on surface of sand for first few weeks until yolk absorbed. Then move to surface or mid water and settle on the bottom by July. Growth is slow, fry < 1 inch by July. Fry move into shallow areas during the day and into deeper water at night. Fry may serve as forage for game fish species.	Small zooplankton when at surface or midwater. After become bottom dwellers, diet shifts to aquatic insect larvae, diatoms, and plant material.
Bridgelip Sucker	Quiet areas in backwaters or edges of main current of rivers with sand or mud bottoms. Seldom found in lakes. Probably entrained into Banks Lake from Columbia River	Little is known about the biology of this species, but it is probably similar to other suckers.	Probably similar to other suckers	Late May to June	Little is known about the biology of this species, but it is probably similar to other suckers	Probably similar to other suckers.
NONGAME SPECIES - <i>Cottidae</i> - Sculpins						
Prickly Sculpin	Lakeshores over sand, gravel, or rubble. Small individuals in vegetated areas in shallow water. During winter move to deeper water under cover of rocks, logs, and debris. Often in open, relying on cryptic coloring for concealment.	Under rocks, logs, cans, car bodies, sheet metal	Relatively shallow	Late February to late May	Larvae begin swimming immediately after hatching. Form schools and remain pelagic for 30-35 days before metamorphosing and settling on the bottom. A number of species prey on prickly sculpin including trout, whitefish, and mergansers.	Zooplankton, aquatic insect larvae

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(*M. salmoides*) in August in Bull Shoals Lake was directly related to acre-days of flooding of terrestrial vegetation (Aggus and Elliott 1975).

Small species of fish and juveniles of larger species occupy aquatic emergent vegetation, seeking food (Pardue 1973; Keast 1984) and predator protection (Crowder and Cooper 1982; Savino and Stein 1989). Differences in density and morphology of plants influence foraging intensity and degree of predator avoidance which, in turn, influence fish growth and survival (Dionne and Folt 1991; Lillie and Budd 1992; Dibble, Dick, and Killgore 1996). Foraging efficiency decreases in dense plant beds (Savino and Stein 1989; Anderson 1984). High-density plant beds provide greater protection from predators than medium- or low-density beds (Hayse and Wissing 1996).

Drawdowns can potentially affect fish in Banks Lake when water levels expose beds of aquatic emergent vegetation that provide cover from predation as well as substrate for food organisms. Table 3-3 displays characteristics for several fish species, including adult habitat, spawning substrate, spawning depth, spawning dates, spawning/reproductive characteristics, and food of young-of-year fish. These characteristics will be used to analyze the impact of August drawdowns on fish.

*Shallow Unvegetated Flats.*—Two key shallow unvegetated flats identified by the Banks Lake RMP/EA include (1) the shallow flats just south of the Million Dollar Mile North Boat Ramp where adjacent lake bottom is used by smallmouth bass; and (2) the flats east of Barker Flat where the adjacent lake bottom is used by largemouth bass, sunfish (*Centrarchidae* spp.), and black crappie (*Pomoxis nigromaculatus*) (fig. 3-5). Other shallow flats that are also potentially important for adult and juvenile habitat include the extensive flats that occur between the Million Dollar Mile North Boat Launch and the Million Dollar Mile South Boat Launch (fig. 3-2 and 3-3) on the southwest side of Banks Lake.

*Boulders, Cobble, and Gravel.*—Boulders, cobble, and gravel are common substrates found predominately along the steep western shoreline of Banks Lake, as well as in the shallow protected bays and unvegetated flats described above. This habitat provides spawning and rearing substrate for a number of fish species, including largemouth bass, smallmouth bass, walleye, and prickly sculpin. Additionally, the young of many of Banks Lake's fish species move offshore in summer after rearing for a number of weeks along the shallow vegetated littoral zone. Boulders and cobbles provide refugia from predators and substrate for benthic invertebrates (fig. 3-6).

#### **Aquatic Food Base.—**

*Zooplankton.*—Banks Lake is the forebay for pumped storage power generation and is dominated by a seasonal flow-through of irrigation water from north to south. The flow-





**Figure 3-5.**—Shallow unvegetated flats, like this one near Baker Flat, provide good habitat for many species of fish.

through creates two distinct pools with the north pool having colder water temperatures, reduced stratification and transparency, and higher plant nutrient levels than found in the south pool. Zooplankton biomass and composition are significantly different in the two pools with the south pool having a higher biomass. The zooplankton biomass of the north pool is composed of roughly equal portions of *Bosmina*, *Cyclops*, *Nauplii*, *Daphnia*, and *Diaptomus*. The south pool zooplankton community is dominated by *Daphnia* with the percentage of *Bosmina* gradually dwindling to insignificant levels at the south end of the lake (Knutzen 1977).

*Benthic Invertebrates.*—Aquatic plants and attached organisms such as algae, protozoans, and bacteria (periphyton), as well as detritus provide food and habitat for a wide variety of organisms. There are typically high invertebrate densities associated with aquatic plants (Hoyer et al. 1997). Very few invertebrates or fish feed directly on the large aquatic plants, but instead feed on the attached organisms and detritus (Heckey and Hesslein 1995).



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**Figure 3-6.**—Much of the shoreline along Banks Lake consists of sand, gravel, cobble and boulders. These are generally exposed to wind and wave action.

Benthic invertebrates that live in sediments collect beneath macrophytes as well. Some use plant remains as food and shelter. Others eat algae that cover sediments. In the Eau galle Reservoir in Wisconsin, benthic invertebrates were more than tenfold greater in number in a coontail (*Ceratophyllum demersum*) bed than in an adjacent barren area with the same substrate (Miller et al. 1989). The inshore area under macrophyte beds in Halverson Lake, Wisconsin contained 60 percent of the midge larvae and over 90 percent each of snails, fingernail clams, and caddisfly, dragonfly, damselfly, and mayfly larvae (Engel 1985) in the lake.

Invertebrates are a major food source for forage fish and young life stages of many game fish. Young waterfowl depend heavily on invertebrates as a high protein food source needed for rapid early growth (Hoyer and Canfield 1997).

### Wildlife

**Importance of Aquatic Emergent Vegetation and Riparian Vegetation.**—Aquatic emergent vegetation and submerged plants are widely consumed by wildlife (Hoyer and

Canfield 1997). Pelikan et al. (1971) reported that 90 percent of the net annual cattail production is consumed or used as lodge construction by muskrats. Smith and Kadlec (1985) reported that waterfowl and mammalian grazers reduced cattail production by 48 percent in the Great Salt Lake marsh. Muskrat grazing is important for maintaining diversity in the emergent zone. Open areas in the cattail marsh are produced that increase edge effect and allow submersed species and other emergent species to invade areas previously occupied by a single species of dense emergent vegetation.

Seeds, tubers, and foliage of submersed species are used as food by a variety of wildlife, especially waterfowl (Nichols and Vennie 1991). Plant material is often high in carbohydrates, which provide energy for long migratory flights. Invertebrates produced in macrophyte beds are also important to wildlife production. They produce the protein that is vital to laying hens and chicks of many waterfowl and related waterbirds. Predators, such as eagles, osprey, loons (*Gavia* spp.), mergansers, cormorants, mink, otter, raccoons, and herons, feed on fish which, in turn, fed on invertebrates that lived in aquatic plant beds (Hoyer and Canfield 1997).

Nesting sites in, or nesting materials from, the emergent zone are important to species like red-winged and yellow headed blackbirds, marsh wrens, western grebes (*Aechmophorus occidentalis*), bitterns, Canada geese, and muskrats. Geese and other waterfowl sometime nest on top of muskrat houses or muskrat food piles made of cattails (Hoyer and Canfield 1997).

Riparian areas are estimated to provide less than 1 percent of the land base in the Pacific Northwest, yet support the greatest diversity and abundance of wildlife that exist in the regions (FWS 1990). The WDFW reports that 90 percent of Washington's terrestrial vertebrate species use riparian areas for some part of their life cycle (FWS 1998). The high wildlife value of these areas is derived from the structural complexity of vegetation, connectivity with other ecosystems, a high edge-to-area ratio, abundant food and water, and a moist and mild microclimate.

Riparian habitats in Washington have been identified as priority areas for monitoring, research, and management of neotropical migrant birds (Andelman and Stock 1994). Extensive woody riparian areas comprised of black cottonwood and willows exist around Osborn Bay. These areas provide habitat for game and nongame birds, furbearers, and other mammals. Unfortunately, quality riparian habitat has become relatively rare in the Columbia Basin due to arid conditions and land use activities such as grazing, conversion to cropland, and inundation of lands for reservoir water storage (FWS 1998). Since Banks Lake was inundated in 1951, willow and cottonwood riparian areas have developed along the margin of Banks Lake.

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Information on the status and management of Banks Lake wildlife species is provided in the RMP/EA incorporated by reference in this document, as well as in the Fish and Wildlife Coordination Act Report (see app. A). Table 3-4 summarizes wildlife species groups present in the Banks Lake littoral zone and on the surface of the lake.

**Table 3-4.—Wildlife of the Banks Lake littoral zone and lake surface.**

Group	Characteristics
Raptors	11 species observed during 8 FWS surveys conducted in 1998. Species present include bald eagles, red-tailed hawks, northern harriers, golden eagles ( <i>Aquila chrysaetos</i> ), prairie falcons, peregrine falcons ( <i>Falco peregrinus</i> ), long-eared owls, short-eared owls, and Cooper's hawks. High diversity of raptor species due to abundance of suitable raptor nesting habitat in basalt cliffs and shoreline trees.
Neotropical Migrant Songbirds	66 species documented at Banks Lake. Neotropical migrant songbirds have experienced widespread habitat destruction and population declines (Andelman and Stock 1994).
Waterfowl	22 species observed by FWS. Average winter count of 4,600 ducks, geese, and swans, ranging from a high of 20,000 birds to 0 when the reservoir was completely ice covered. Southeast shoreline provides habitat for several thousand mallards and northern pintails and several hundred Canada geese during fall migration. Most breeding occurs below Dry Falls Dam, in the Devil's Punch Bowl and in Osborn Bay. More scattered use occurs in smaller bays and inlets in the main lake and adjacent wetlands (FWS 2000).
Colonial Nesting Birds	5 species have been documented in the three islands in the south end of Banks Lake: great blue heron, black-crowned night heron, California gulls, ring-billed gulls, and Caspian terns. Western grebes have been observed nesting in Osborn Bay and Devil's Punch Bowl and in smaller numbers elsewhere in cattails and bulrushes in the littoral zone. American white pelicans are documented using the south end of Banks Lake during spring and fall migrations (FWS 2000).
Mammals	47 species have been documented or potentially occur at Banks Lake. Mule deer, coyotes, Nuttall's cottontail, and porcupine are common. Black bear and mountain lion are thought to be transients through the area.
Amphibians and Reptiles	11 species have been documented at Banks Lake. The racer was the most common species followed by the western rattlesnake. The long-toed salamander may potentially have larvae in the water during the August drawdown period. Great Basin spadefoot, western toad, and Pacific tree frogs occupy a wide variety of habitats in eastern Washington and may potentially occur in Banks Lake. Bullfrogs are present. This exotic species has adversely affected native amphibians and may have adversely affected natives at Banks Lake as well.

## **Threatened, Endangered, and Special Status Species**

### **National Marine Fisheries Service**

As mentioned in chapter 1, *Purpose of and Need for Action*, the NMFS BIOP for the operation of the FCRPS, provided Reclamation with Reasonable and Prudent Alternative (RPA), Action 31. Action 31 recommends that Reclamation assess the environmental effects of operating Banks Lake August surface elevations to minimum elevation 1560 feet, so that additional Columbia River water may be available for migration flows for juvenile salmonids listed under the ESA.

This draft EIS and its Action Alternative are intended to meet the intent of Action 31. The Final EIS and the Record of Decision will document the completion of RPA Action 31. Reclamation need not further consult with NMFS regarding the proposed project.

The following provides a brief description regarding the importance of river flows for the federally listed salmon.

Banks Lake drawdown is one of several RPA actions recommended by NMFS to improve flows for migrating fish. In addition to providing physical barriers for fish migration, dams also create reservoirs, which widen the river and decrease river flows. Decreased river flows result in increased salmon travel time and greater predator exposure and other mortality factors. Such flow reduction is particularly harmful to anadromous fry, which have a reduced swimming ability. Fry are greatly dependent upon river flows to assist their journey to the estuarine environment. Park (1969) observed that after completion of dams in the upper Columbia River, downstream migration of chinook salmon fry extended through August, where previously the migration was completed by July (Mains and Smith 1964). Therefore, another impact of dams on anadromous salmon is the shift in rearing from the estuary to reservoirs and extended residence in mainstream rivers (Northwest Fisheries Science Center 2000).

### **Fish and Wildlife Service**

The following discussion on threatened and endangered species, as well as the threatened and endangered species discussion included in chapter 4 of this draft EIS, provides Reclamation's Biological Assessment, as required under 50 CFR 402.

As part of the informal consultation process, Reclamation requested the U.S. Fish and Wildlife Service (FWS) to provide a list of federally listed or proposed species that may occur in the area of Banks Lake. In a letter dated May 30, 2001, the FWS provided Reclamation



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with the federally listed and proposed species, as well as candidates for Federal listing, in the Banks Lake area. Although no federally listed endangered species were included in the May 30, 2001 FWS letter, the FWS announced an emergency listing of the Columbia Basin distinct population segment of the pygmy rabbit (*Brachylagus idahoensis*) as endangered, on November 30, 2001 (Federal Register 2001). The bald eagle (*Haliaeetus leucocephalus*) and the Ute ladies'-tresses (*Spiranthes diluvialis*), both federally listed as threatened species, were included in the FWS letter. No proposed-to-be-listed species were provided. The Western sage grouse (*Centrocercus urophasianus*) and the Washington ground squirrel (*Spermophilus washingtoni*) were included by the FWS as candidate species for Federal listing. Although candidate species are not afforded the same protection as listed species under the ESA, they are evaluated in this EIS.

The following text provides a brief description of the status and distribution; life history and ecology; and the reasons for decline of the species described above.

#### **Pygmy Rabbit (*Brachylagus idahoensis*).—**

*Status and Distribution.*—Within Washington, the range of the pygmy rabbit has been reduced to five isolated fragments of sagebrush-dominated habitat within Douglas County. It is listed as a State endangered species. On November 30, 2001, the U.S. Fish and Wildlife Service announced an emergency listing of the Columbia Basin distinct population segment of the pygmy rabbit species as endangered (Federal Register 2001). Surveys conducted by FWS were unable to find any pygmy rabbits within the Banks Lake area (FWS 2002); however, FWS recommends that additional surveys should be conducted before any future activities are allowed which could adversely affect the sagebrush-steppe community.

*Life History and Ecology.*—This is the smallest North American rabbit species and is one of only two rabbit species in North America that dig its own burrows in deep loose soil. They are dependent on tall dense sagebrush for food and shelter.

*Reasons for Decline.*—WDFW (1995) indicates that most of the original pygmy rabbit habitat in Washington has been degraded to the point that it can no longer support this species. Additional losses may occur through conversion of the shrub-steppe to cropland or grazing land for cattle or through wildfire.

#### **Bald Eagle.—**

*Status and Distribution.*—The bald eagle is a Federal and State listed threatened species. They were the most common raptor observed during surveys conducted by the U.S. Fish and Wildlife Service at Banks Lake (FWS 2000). Eagles were found around the entire shoreline of Banks Lake, perched in large trees, usually black cottonwood or ponderosa pine.

They were also observed on rocky islands and outcrops near shore and on rock outcrops up to 0.5 mile from shoreline, often high on cliff faces, as well as on ice during winter (FWS 2000). Most of the large trees along the shoreline were used by eagles at some time during the winter. About a dozen specific trees nearly always contained one to ten individuals. The high count in 1998 was 126 eagles, with an average count of 63 birds for that year. The high count in 1999 was 63 eagles with an average count of 46 birds. Northrup Canyon probably contains the largest bald eagle communal roost in eastern Washington (FWS 2000).

Bald eagles have nested on the north side of Steamboat Rock for several years. One chick was found in the nest on June 2, 1998, but no nesting activity was observed there during 1999. A new nest was discovered near Osborn Bay in 1998, with at least one eaglet successfully fledging from that nest. The Steamboat Rock nesting pair became established and successfully nested adjacent to intense recreational activities in the State park. A popular boat-in campground is located just east of the nesting site. The impact of human disturbance is expected to increase as nearby recreation activities and public awareness of nesting eagles rise (Reclamation, *Banks Lake Resource...*, 2001).

Bald eagles are known to roost in Russian olives present in the riparian zone at Banks Lake. Mature cottonwoods and willow trees are also used. Many of the mature cottonwoods and willows are at risk from shoreline erosion.

The Steamboat Rock Bald Eagle Nest Territory Management Plan was developed to manage and protect the nest site at Steamboat Rock. That plan, however, does not address the recent expansion of the nesting territory into Osborn Bay.

*Life History and Ecology.*—The abundance and availability of prey is probably the most important factor determining the presence and density of eagle territories. Reservoirs and introduced fishes and concentration areas for wintering waterfowl may mitigate, to some extent, the impact that salmon declines may have had on eagles. Eagles may be able to nest or winter at locations that historically did not have sufficient prey to support them. There are some 4,051 lakes and reservoirs in eastern Washington. Of the 76 fish species in Washington's inland waters, 30 are introduced (Wydoski and Whitney 1979). Stinson et al. (2001) speculate that some introduced fish species are more available to eagles during the late nesting period than are live salmon. Introduced fish species eaten by bald eagles that also occur at Banks Lake include black crappie, walleye, smallmouth bass, brown bullhead, lake whitefish, channel catfish, yellow perch, largemouth bass, and sunfishes (Stinson et al. 2001).

Nesting bald eagles feed predominately on fish and waterfowl, which are usually associated with large, open expanses of water (Stalmaster 1987). They forage mostly close to shoreline perch trees (<1,640 feet), and areas of shallow water may be preferred because the limited depth brings fish closer to the surface (Buehler 2000).

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*Reasons for Decline.*—One of the most significant problems for Washington's bald eagles is the continued loss of mature and old growth Douglas fir forest used for nesting habitat in the lowlands around Puget Sound due to urbanization. Most eagles are sensitive to disturbance during nesting (Stinson et al. 2001). Salmon declines in the Columbia River may have adversely affected populations in Washington.

#### **Ute Ladies'-Tresses.—**

*Status and Distribution.*—Ute ladies'-tresses (*Spiranthes diluvialis*), a perennial orchid, was federally listed as threatened in 1992. It is also a State threatened species. Its presence was confirmed in southeastern Idaho in 1996 along the upper Snake River and in northern Washington in 1997. A population is also known to occur in Okanogan County, Washington (NMFS 1999). Prior to this, it was known only from a few locations in Montana, Colorado, Wyoming, and Nebraska.

This is a wetland and riparian species found in springs, wet meadows, river meanders, and flood plains from elevations 1500 to 7000 feet (FWS 1998). Banks Lake habitats where *S. diluvialis* may occur include wet meadows fed by freshwater springs; riparian forest, riparian shrub, and wet meadow mosaics; wet areas in open shrub or grassland; wetlands created in gravel or borrow pits; and habitats dominated by grasses, rushes, and sedges.

*Life History and Ecology.*—Ute ladies'-tresses inhabit full sun to partial shade in early to mid-seral communities subject to flooding or periodic inundation. Beaked spikerush (*Eleocharis rostellata*) appears to be the dominant species in habitat occupied by Ute ladies'-tresses, and is a good indicator throughout its range. Other species commonly associated with the orchid include creeping bentgrass (*Agrostis stolonifera*), Baltic rush, long-styled rush, and scouring rush (*Equisetum laevigatus*). Other common associates include rushes (*Juncus* spp.), paint-brushes (*Castilleja* spp.), thinleaf alder saplings (*Alnus incana*), narrowleaf cottonwood saplings (*Populus angustifolia*), sweetclover (*Melilotus* spp), willow saplings (*Salix* spp.), sedges (*Carex* spp.), red clover (*Trifolium praetense*), and western goldenrod (*Solidago* spp).

The FWS conducted Ute-ladies-tresses surveys in late August 1999 during the peak blooming period when this species is most conspicuous. The FWS found no Ute ladies-tresses and little potential habitat within the Banks Lake area (FWS letter dated August 31, 1999). The FWS concluded that the Banks Lake shoreline is either too steep and rocky, too dry, or inundated for too long during the growing season to provide suitable habitat for this species. The FWS did, however, identify two perennial streams along the northwest shoreline and Bebe Springs as potentially suitable habitat, and recommended that additional surveys be conducted at these sites. Plants bloom in late summer. However, complicating surveys is the fact that this species can remain dormant for several growing seasons or produce only vegetative shoots.

*Reasons for Decline.*—Urbanization, stream channelization, water diversions, watershed degradation, conversion of riparian and flood plain to agricultural uses, and decline of pollinators have all contributed to the decline of this species (Washington DNR 2001). This species also appears to have a very low reproductive rate and does not compete well with aggressive species, such as reed canarygrass or purple loosestrife.

#### **Western Sage Grouse.—**

*Status and Distribution.*—Western sage grouse is a candidate for Federal listing and a State threatened species. There are two populations in Washington which total about 1,000 birds. They occur 34 miles apart in Douglas County and parts of Kittitas and Yakima counties. Both populations exhibit relative low numbers of males at leks, making them vulnerable to predation, inclement weather, fire, and increased grazing pressure. Small reductions in habitat quality may have significant effects on the continued use of leks. It has not been documented within the Banks Lake study area, but it has been found in sagebrush habitat adjacent to Barker Canyon (Reclamation, *Banks Lake Resource...*, 2001).

*Life History and Ecology.*—Western sage grouse nesting habitat was characterized by Sveum et al. (1998) who found that most of the nests (71 percent) were in big sagebrush (*Artemisia tridentata* Nutt.)/bunchgrass communities. Successful nests had less shrub cover (51 percent) and shrub height (64 cm) than nests that were depredated (70 percent and 90 cm, respectively). During summer in Washington, sage grouse were observed moving from sagebrush to wet areas with annual forbs in fallow fields. Sage grouse on the Yakima Training Center did not frequent springs, major streams, and associated riparian areas for water and food (Cadwell et al. 1994). However, in Oregon, they were observed feeding on forbs near playas, water holes, and meadows in summer (Willis et al. 1993).

*Reasons for Decline.*—Primary threats to remaining sage grouse populations include the potential reduction of lands in the Conservation Reserve Program and the potential for large-scale fires that eliminate large stands of sagebrush. Protection of remnant patches of native habitat is the most critical need for sage grouse (Hays et al. 1998).

#### **Washington Ground Squirrel.—**

*Status and Distribution.*—The Washington ground squirrel (*Spermophilus washingtoni*) is a candidate species for Federal listing and a candidate for State listing. Its range in Washington extends east of the Columbia River from the center of the State southward into Oregon. The known occurrence of this species presently consists of three disjunct populations, two in Washington on the Hanford Reservation and in the Columbia National Wildlife Refuge near Othello, and one in Oregon (Betts 1990). The Washington Gap Analysis Program indicates that core habitat for this species includes the southern portions

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of Grant and Douglas Counties south of Banks Lake, but none is present in the Banks Lake area (Washington Coop. Fish and Wildlife Research Unit 2001). FWS (2000) indicates that this species has been documented within the southeast portion of the study area several years ago.

*Life History and Ecology.*—This species inhabits sagebrush and grassland in the Columbia Plateau. Betts (1990) found that *S. washingtoni* colonies were found in habitat that had significantly greater values for percent cover of annual grasses, total grasses, and forbs than the surrounding unoccupied habitat. Their range is restricted to the sandy soil regions.

*Reasons for Decline.*—Grazing, fire, cultivation, and irrigation have degraded and altered much of the vegetation of the Columbia plateau.

### **Species of Concern**

In the draft Fish and Wildlife Coordination Act Report (CAR), the FWS identified several species that were either State listed, proposed, or candidates for listing (app. A). Several of these species, consisting of the fringed myotis (*Myotis thysanodes*), long-eared myotis (*Myotis evotis*), olive-sided flycatcher (*Contopus borealis*), western burrowing owl (*Athene cunicularia hypugae*), California floater (*Anodonta californiensis*), and northern sagebrush lizard (*Sceloporus graciosus graciosus*) have not been documented, or are currently not present, in the Banks Lake area. These species would not be impacted and are not considered in the remainder of this draft EIS.

The following species, also included in the CAR, are evaluated in the draft EIS.

#### **Pale Townsend's Big-Eared Bat.—**

*Status and Distribution.*—This bat (*Corynorhinus townsendii*) occurs throughout Washington except in the highest mountain ranges. The Washington Gap Analysis Program shows the habitat at Banks Lake lies within the core zone of this species (Washington Coop. Fish and Wildlife Research Unit 2001). It has not been documented in Banks Lake, but has been observed in nearby Moses Coulee. FWS (2002) considers it likely to occur at Banks Lake. It is a State candidate species and Federal species of concern.

*Life History and Ecology.*—This species occurs from grasslands to forested areas, roosting in trees, buildings, and caves. It forages more in uplands rather than over water or riparian areas. This species relies heavily on abandoned mines for roost and maternity colony sites.



*Reasons for Decline.*—The primary threat to the big-eared bat is from disturbance or destruction of roost and maternity colony sites from recreational caving, mine reclamation, and renewed mining activity in historic areas. Timber harvest adversely affects roosting and foraging habitat; and pesticide spraying in forests and agricultural areas adversely affects prey base.

**Small-Footed Myotis.—**

*Status and Distribution.*—The small-footed myotis (*Myotis ciliolabrum*) occurs throughout eastern Washington. The Washington Gap Analysis Program shows the habitat at Banks Lake lies within the core zone of this species (Washington Coop. Fish and Wildlife Research Unit 2001). This bat has not been documented at Banks lake, but has been documented in nearby Moses Coulee. FWS (2002) considers it likely to occur at Banks Lake. It is a Federal species of concern.

*Life History and Ecology.*—The small-footed myotis occurs in open arid areas in deserts, chaparral and pinon-juniper forests, foraging around cliffs, rock outcrops, and dry canyons. It roosts singly or in small groups in cliff and rock crevices, buildings, concrete overpasses, caves, and mines.

*Reasons for Decline.*—Western small-footed myotis are adversely affected by mine closures and by recreational use of these sites. Destruction of prey base from pesticides and other environmental contaminants also adversely affects this species.

**Yuma Myotis.—**

*Status and Distribution.*—The Yuma myotis (*Myotis yumanensis*) is scattered throughout Washington except in the highest mountains and extremely arid areas. The Washington Gap Analysis Program shows the habitat at Banks Lake within Grant County lies within the core zone of this species (Washington Coop. Fish and Wildlife Research Unit 2001); however, no habitat is listed for Douglas County. A large roost with over 1,000 individuals of Yuma myotis has been located near Northrup Creek (FWS 2002). It is a Federal species of concern.

*Life History and Ecology.*—Yuma myotis occur in a variety of habitats ranging from riparian, scrublands, deserts to forests. It roosts in bridges, buildings, cliff crevices, caves, mines, and trees. Summer maternity colonies can number several thousand females and young. Males roost singly. This species forages over water, along streams, springs, and along riparian and shoreline vegetation. It is extremely reliant on water.

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*Reasons for Decline.*—This species can be adversely affected by closure of abandoned mines without adequate surveys and by disturbance of maternity roosts in caves and buildings. Since this species frequently occurs in buildings and other human structures, it is vulnerable to destructive pest control activities. Some riparian and forest management practices may be detrimental.

#### **Black Tern.—**

*Status and Distribution.*—The Washington Gap Analysis Program indicates the presence of some core habitat for the black tern (*Chlidonias niger*) in the Banks Lake Area (Wash. Coop. Fish and Wildlife Res. Unit 2001). This small insectivorous tern occurs statewide in or near freshwater marshes, ponds, or lakes. A large colony of terns exists on Goose Lake on the Colville Reservation and in Douglas County. There are no breeding records for the black tern at Banks Lake. FWS (2002) believes the most likely occurrence of this species at Banks Lake would be during spring and fall.

*Life History and Ecology.*—The preferred summer habitats are inland marshes and sloughs with dense cattail or other emergent vegetation interspersed with open water. It is a colonial nester.

*Reasons for Decline.*—The continuing loss and degradation of breeding habitat due to wetland drainage is the main reason for the decline in black tern populations. Reduced hatching success in the Midwestern United States may be due to agricultural pesticides.

#### **Columbia Sharp-Tailed Grouse.—**

*Status and Distribution.*—This State threatened subspecies (*Tympanuchus phasianellus columbianus*) has been documented in the past in Barker Canyon and possibly Northrup Canyon (FWS 2002). The Washington Gap Analysis Program indicates that core habitat for this species exists in the vicinity of Banks Lake in Douglas County (Washington Coop. Fish and Wildlife Research Unit 2001). Approximately 700 birds occur in north-central Washington in small scattered populations (Fed. Register 1999).

*Life History and Ecology.*—It is found in shrub-steppe, grassland, mountain shrub, and deciduous riparian habitats.

*Reasons for Decline.*—The population of this grouse has declined substantially as a result of habitat loss and degradation. Conversion of native habitats to agricultural crop use, livestock grazing, and suburban development, as well as dam construction, herbicide spraying, and fire continue to threaten this subspecies (Fed. Register 1999).

**Loggerhead Shrike.—**

*Status and Distribution.*—The loggerhead shrike (*Lanius ludovicianus*) is a State candidate species. The Breeding Bird Atlas shows breeding records for the Banks Lake area for this shrike. The Washington Gap Analysis Program also lists core habitat for this species in the Banks Lake area (Wash. Coop. Fish and Wildlife Res. Unit 2001). FWS (2002) indicates that six individuals were observed during 1998 breeding bird surveys at Banks Lake.

*Life History and Ecology.*—This predatory bird of open areas of shrub-steppe, pine-oak, and pinon-juniper woodlands zone feeds on insects, small birds, and mammals.

**Columbia Spotted Frog.—**

*Status and Distribution.*—The Columbia spotted frog (*Rana luteiventris*) has been documented in the Banks Lake area (FWS 2002) as well as in areas scattered across much of eastern Washington. The Washington Gap Analysis Program indicates that much of Banks Lake is in the peripheral zone of this species rather than in the core zone (Washington Coop. Fish and Wildlife Research Unit 2001). This species population has dramatically declined in the last 50 years. It has been virtually eliminated from the Puget Sound. It is a State candidate species.

*Life History and Ecology.*—It prefers warm water marshes, wetlands, and bogs with nonwoody wetland vegetation. Vegetation in breeding pools generally consists of grasses, sedges, and rushes. It has a slow development rate, taking from 4 to 6 years to reach sexual maturity (Turner 1960).

*Reasons for Decline.*—The presence of introduced predatory fish into previously fish-free water bodies has contributed to the decline of amphibians in western North America (Corn 1994). Additionally, habitat loss and degradation due to wetland drainage, urbanization, livestock grazing, and logging have also contributed to its decline. Its slow development rate also subjects it to increased disturbance and competition from more robust exotics such as bullfrogs.

**Chelan Rockmat.—**

*Status and Distribution.*—This species (*Petrophyton cinerascens*) is endemic to cliffs along a 17-mile area on the Columbia River between Chelan and Wenatchee, in Chelan and Douglas Counties, Washington. The FWS (2002) indicates that it may potentially also occur along the basalt cliffs of Banks Lake. It is a State threatened species.

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*Life History and Ecology.*—Chelan rockmat is a low, mat forming perennial with 2- to 6-inch tall flowering stems. This species has an extremely narrow range, suggesting it lacks competitive vigor or has a nutrient requirement met only by a specific substrate (Washington DNR 2001). It has been found only in crevices and ledges of open cliffs and rock outcrops along the Columbia River.

*Reasons for Decline.*—Habitat destruction from rock quarrying, road construction, and power line and radio tower construction are thought to be the principal threats to this species. Recreational activities such as rock climbing may also have adverse impacts.

### **Sticky Phacelia.—**

*Status and Distribution.*—This species (*Phacelia lenta*) is endemic to a small area along the basalt cliffs of the Columbia River in an area of approximately 12 by 8 miles in Douglas County, Washington. It occurs on crevices and adjacent open rocky habitats. Elevations range from 1300 to 3400 feet. Recent searches of suitable habitat have not located any specimens outside of Douglas County (Washington DNR 2001). FWS (2002) indicates that it may also occur along the basalt cliffs of Banks Lake. It is a State threatened species.

*Life History and Ecology.*—Sticky phacelia occurs in basalt outcrops with generally very little other vegetation present. However, it is speculated that competition may be high for these sites, given the lack of soil and limited water availability.

*Reasons for Decline.*—Direct destruction of this plant's habitat is the major threat to its long-term survival. Rock quarrying and road construction should avoid this species' habitat. Aerial herbicide application on adjacent agricultural fields may also pose some threat.

## **Economics**

### **Hydropower Resources**

Banks Lake and the pump-generating plant that pumps water into Banks Lake are an integral part of the Grand Coulee power generating complex and are also used as a means of regulating Federal Columbia River Power System (FCRPS) power production. The pump-generating plant houses six pump/generators and another six pumps. Banks Lake plays an important part because of its use in regulating power system loads by both generating and using power.

The Grand Coulee power complex is one of 31 Federal power projects in the Columbia River drainage that are interconnected by the Bonneville Power Administration transmission

system to form the FCRPS. The FCRPS facilities are coordinated with other utilities to take advantage of differences in streamflows, loads, generation, and maintenance schedules to better use their resources. Utilities can then more efficiently use their hydropower and thermal facilities. This coordination allows the system to be operated as if it were owned by a single operator, synchronizing operations to maximize power production. Grand Coulee provides about one-third of the FCRPS's total generating capacity.

The Grand Coulee power complex consists of three powerplants and a pump-generating plant. The power complex generates around 21 billion kWh annually of which about 900 million kWh (4.7 percent) is used for pumping CBP irrigation water. The rest is marketed commercially by BPA, the Federal power marketing agent for the Pacific Northwest. BPA markets the power through its own transmission lines in Washington, Oregon, Idaho, western Montana, and small parts of Wyoming, Nevada, Utah, California, and eastern Montana. BPA also sells or exchanges power with utilities in California and Canada.

BPA is allowed to schedule and market the generation from Grand Coulee. Power operations must conform to several multiple use operation requirements, such as flood control, fish augmentation flows, FDR Lake daily drawdown limitations, downstream flow fluctuation limits due to bank instability, etc. Scheduling of the BPA load is divided into two categories, heavy load hours of 6 a.m. to 10 p.m. Monday through Saturday, and light load hours for the remainder of the time. Commonly, only a few of the large units will be run during light load hours, while many more units will run, often including the pump/generator (P/G) units during heavy load hours to help balance and meet BPA system loads.

**Left and Right Powerplants.**—The Left Powerplant and Right Powerplant, at the Grand Coulee complex, are operated for commercial power purposes and during the irrigation season to provide power for Pumping Plant units 1-6. Generators 1, 2, and 3 are each used to provide pumping power directly to Pumps 1-6 without being connected to the transmission system. Residual power not used for CBP purposes is provided to the 230-kV switchyard for commercial use.

**Third Powerplant.**—The Third Powerplant is operated for commercial power purposes and provides power to the 500-kV switchyard for distribution by BPA through their distribution grid. During an average year, approximately 50 percent of the total energy production is generated by the Third Powerplant. An important contribution of the Third Powerplant is its ability to provide “spinning reserve” to the FCRPS. Generators are provided enough water to keep them spinning yet not generating any appreciable amount of power; this allows for an almost instantaneous ability to provide power for unexpected or unusually high demands. This spinning reserve is a much more cost efficient means of providing for immediate power needs than coal- or gas-fired generation.

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**Pump-Generating Plant.**—The primary purpose of the plant is to pump water for irrigation delivery to CBP lands via Banks Lake. For the period of 1989-1998 a 10-year average of 2,592,000 acre-feet of irrigation water has been pumped for irrigation. The pumping season runs about 198 days, from approximately April 1 through October 15 of each year. Pumping needs are weather dependent and normally increase during the hottest months of July and August. However, if a constant pumping rate were required for 198 days of the irrigation season, an average pumping rate of approximately 6,600 cfs would be needed.

Each of the six P/G plant pumps is rated at 65,000 horsepower and is capable of pumping 1,600 cfs at 292 to 310 feet of head. Each of the six pump-generators is rated at approximately 67,000 horsepower and 50,000 kilowatts in the generation mode. Total plant pumping capacity is approximately 20,000 cfs, depending on pumping head. The excess pumping capacity allows the P/G plant to be used in a “load management” mode. Pumping schedules can be managed to allow delivery of water into Banks Lake when power demands are low and accordingly power purchase costs are also low. This load management typically results in heavy pumping during the night and weekend hours with little or no pumping during power “peak” hours. This operation not only provides load management but enhances Federal revenues by consuming power (pumping) when power has its least value and allowing maximization of generation and sales when revenues are highest. When Banks Lake levels drop below elevation 1562 feet, water levels are below the discharge pipe crest elevations, prohibiting operation of the generating side of the pump/generators.

The 6 pump-generators provide 300,000 kW when in the generating mode. When using the 6 pumps and the 6 pump-generators for pumping 600,000 kW of power are used. This provides a “load swing” of 900,000 kW. This operational flexibility contributes a great deal of versatility when managing the FCRPS, both from a system operation and a marketing perspective.

The P/G units also provide peak pumping capability to ensure CBP irrigation water deliveries during the heavy delivery months of July and August. Pumping capacity of the original six pumps is limited to approximately 10,000 cfs. Irrigation deliveries in July and August may exceed that total, and operation of the P/G units allows meeting those irrigation demands without undue fluctuation of Banks Lake.

Typical weekday summer pumping normally takes place from about 10 p.m. the previous day to 8 a.m. of the current day. The number of pumps operated depends on the amount of irrigation withdrawals taking place. At 8 a.m., the pumps and P/Gs running in the pump mode are stopped. The P/G units may then be restarted in the generation mode if needed to meet power load requirements or spinning reserve demands.

Typically, on Fridays at approximately 10 p.m., the pumps and P/G units are started to provide continuous pumping throughout the weekend until 8 a.m. on Monday. The number of units used will depend on irrigation withdrawals and the need to refill Banks Lake.

During the winter nonirrigation season, the P/G plant is operated only to meet power requirements. The P/G units may be operated to either produce energy or meet system requirements, such as spinning reserve or standby reserves. System requirements are significantly affected by weather conditions. Severe cold spells may result in operation of the P/G units in the generation mode. Stabilization of Banks Lake is maintained at winter levels by pumping into the lake only the water needed to replace water used for generation. In addition to replacement of water used for generation, additional water is pumped to make up for evaporation and seepage.

**Low Head Powerplant on the Main Canal below Banks Lake and Dry Falls Dam.**—A municipal low head hydropower generation plant is located just below Dry Falls Dam on the Main Canal and is owned by the three irrigation districts that receive CBP water. This facility generates power for commercial sale from CBP irrigation water releases from Dry Falls Dam and is not part of the FCRPS. The Main Canal powerplant is operated by the GCPHA, who markets the power through contracts with the cities of Seattle and Tacoma, Washington. Generating capacity is 26 MW for the plant with annual generation averaging 92,000 MWh. As a condition of the Federal Energy Regulatory Commission licensing for the powerplant, barrier nets must be placed in Banks Lake at the beginning of the kokanee salmon entrainment period (May 15) and remain in place until the end of the irrigation season.

**Public Utility District Power Plants on the Columbia River.**—There are five publicly owned hydropowerplants on the Columbia River in Washington downstream of Grand Coulee and Chief Joseph Dams. They are Wells Hydroelectric Project owned and operated by Douglas County Public Utility District (PUD), Rocky Reach and Rock Island hydro-projects owned and operated by Chelan County PUD, and Priest Rapids and Wanapum Developments owned and operated by Grant County PUD. The operation of these five powerplants is coordinated with the FCRPS, and they all have fish passage structures.

*Wells Hydroelectric Project.*—This project is located 15 minutes north of Chelan, Washington and is the chief generating resource for Douglas County PUD, producing its first commercial power generation in 1967. The project has ten generating units rated at a combined 840 MW and provides power to Douglas County PUD, Puget Sound Energy, Portland General Electric Company, PacifiCorp, Avista Corporation, and the Okanogan County PUD (Douglas County Public Utility District 2002).



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*Rocky Reach Project.*—This project is located about 7 miles upstream from the city of Wenatchee, Washington and consists of 11 generating units that have a combined capacity of 1,287 MW. The initial seven generators were placed in commercial operation in November of 1961, with an additional four generators being added and placed in service in 1971. Electric output is provided to the Chelan County PUD distribution system and its 7 million customers as well as the regional grid of BPA (Chelan County Public Utility District, *Rocky Reach Hydro Project*, 2002).

*Rock Island Project.*—The Rock Island Project is located about 12 miles downstream from Wenatchee, Washington and consists of a dam and two powerhouses. The first powerhouse was constructed and placed in service in 1933 and consisted of four generating units. An additional 6 units were added and placed in service in April of 1953, bringing the total generating capacity of the ten units to 212 MW. The second powerhouse with its eight generators was placed in commercial operation in August of 1979 and has a capacity of 410.4 MW, making the total nameplate capacity of both powerhouses 632.4 MW. Electric output is delivered to the District's power distribution system in the Wenatchee area and also to the BPA transmission grid (Chelan County Public Utility District, *Rock Island Hydro Project*, 2002).

*Wanapum Development.*—The Wanapum Development consists of a dam and hydroelectric generation plant 18 miles upstream from the Priest Rapids Development. The generating plant consists of ten units and has a total capacity of 1,038 MW and has been in commercial operation since January 1965. Electric output is delivered to the BPA transmission network for distribution (Grant County Public Utility District 2002).

*Priest Rapids Development.*—The Priest Rapids Development consists of a dam and hydroelectric generation station with a rated capacity of 955.6 MW. It is located about 130 air miles southeast of Seattle, Washington and began commercial power generation in October of 1959. About 64 percent of the electric output is distributed through the transmission network of the BPA to twelve purchasers, with the remaining output being used by Grant County PUD (Grant County Public Utility District 2002).

## **Regional/Local Economy**

Banks Lake is located along the northern border of Grant County, although some relatively small areas of the western shoreline of the lake extend into Douglas County. The steep cliffs that surround most of Banks Lake limit access to the lake, especially on the west side of the reservoir. State Route 155 runs along the east side of the lake and provides primary access to the lake and most developed recreation facilities. Any impacts on the economic environment from the Action Alternative due to changes in recreation use of the lake would be expected to occur in Grant County. For these reasons, Grant County is selected as the

affected area for this study. The following information was used as the basis for analyzing impacts on the local economy.

Grant County is a mostly rural area with small towns scattered throughout the county. The entire county has a population of 74,698 (U.S. Census Bureau 2000g). This figure represents an increase of 36.4 percent over the 1990 population. However, the county only accounts for approximately 1.3 percent of Washington's population—5,894,121 (U.S. Census Bureau 2000h). Moses Lake (located in south central Grant County) is the largest city with a population of 14,953. Farther north is the county seat, Ephrata, which is about 30 miles south of Coulee City. Coulee City is found at the southern end of Banks Lake. Ephrata has a population of 6,808 and Coulee City has a population of 600 (U.S. Census Bureau 2000a, 2000c). Electric City, population 922, is located at the north end of Banks Lake (U.S. Census Bureau 2000b).

In 1999, the people of Grant County had a per capita personal income (PCPI) of \$19,424. The county ranked 32 out of the 39 counties in Washington (Bureau of Economic Analysis 2001a). This PCPI was only 64 percent of the State average of \$30,380 and 68 percent of the national average, \$28,546 (Bureau of Economic Analysis 2001b). Income and employment data for 1999 are shown in table 3-5. Total personal income amounted to \$1,398,915,000.<sup>1</sup> This amount ranked 18 in the State, and Grant County accounted for 0.8 percent of the State total. Farming accounted for 11.3 percent or \$158,160,000 of the total. Total employment amounted to 38,743 full- and part-time jobs. Employment in farming provided 18.7 percent of these positions, the most of any economic sector. Services (17.2 percent) and government (16.6 percent), at all levels, were the next most important sectors for employment.

The earnings of people employed in Grant County amounted to \$919,294,000 in 1999.<sup>2</sup> The largest industries, by earnings, were State and local government (22.1 percent of total earnings), farming (14.7 percent of total earnings) and services (3.0 percent of total earnings).

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<sup>1</sup> Total personal income includes the earnings, dividends, interest, rent, and transfer payments received by residents of Grant County (Bureau of Economic Analysis 1999 data).

<sup>2</sup> Earnings include wages and salaries, other labor income, and proprietors' income. This figure represents actual earnings data for 1999 collected and reported by the Bureau of Economic Analysis (2001c).

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**Table 3-5.—Employment and income data for Grant County, 1999.**

<b>Economic Sector</b>	<b>Employment*</b>		<b>Personal Income and Earnings**</b>	
	<b># of Jobs</b>	<b>% of Total</b>	<b>1999 \$</b>	<b>% of Total</b>
Total	38,743	100.0	1,398,915,000	100.0
Wage and Salary Workers	30,999	80.0	800,725,000	57.2
Proprietor's	7,744	20.0	118,569,000	8.5
Farm Occupations	7,230	18.7	134,997,000	9.7
Non-Farm Occupations	31,513	81.3	784,297,000	56.1
Ag. Services, Forestry, and Fishing	1,766	4.6	27,989,000	2.0
Mining	(D)	(D)	(D)	(D)
Construction	1,520	3.9	46,230,000	3.3
Manufacturing	5,027	13.0	153,495,000	11.0
Transportation and Public Utilities	1,469	3.8	47,879,000	3.4
Wholesale Trade	1,592	4.1	48,820,000	3.5
Retail Trade	5,506	14.2	94,168,000	6.7
Finance, Insurance, and Real Estate	(D)	(D)	(D)	(D)
Services	6,680	17.2	119,171,000	8.5
Government	6,444	16.6	223,220,000	16.0
plus: Dividends, Interest, and Rent			270,788,000	19.4
plus: Transfer Payments			276,163,000	19.7
less: Personal contributions for social insurance			(44,984,000)	-3.2

\* Employment in full- and part-time jobs.

\*\* Personal income and earnings in thousands of 1999 dollars.

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

Source: Bureau of Economic Analysis, Regional Economic Information System, 1999 (Bureau of Economic Analysis 2001c, 2001d).

In 1990, the unemployment rate for Grant County was 8.5 percent (Bureau of Labor Statistics 2000). This rate rose to 10.6 percent in 1996 and fell to 10.1 percent in the year 2000. The poverty rate in Grant County declined from 19.6 percent in 1989 to 17.7 percent in 1993 and then to 14.9 percent in 1997 (U.S. Census Bureau 2000e, 2000f, 2000i). This rate was still much higher than the Washington State average of 10.2 percent

A regional input-output model, Impact Analysis for Planning (Implan), was used to establish the baseline economic conditions in Grant County. This version of Implan (Professional 2.0) utilizes 1998 data, which are the most current available. Implan analysis identified the

total industry output for Grant County, Washington, as being \$3,384,384,000 in 1998 (Minnesota Implan Group, Inc. 1998, 1999, 2000). At the same time, the Grant County economy supported 37,709 jobs, and labor income was \$938,912,000.<sup>3</sup>

## Recreation

Banks Lake is recognized locally and regionally for its diverse and outstanding recreational opportunities. The reservoir's clear waters support one of the finest fisheries in the state and outstanding opportunities exist throughout the area for camping, swimming, boating, picnicking, and other recreational pursuits.

Many recreationists are drawn to Banks Lake because of the diverse and scenic natural features of the area (e.g., basalt outcrops and spectacular coulee walls) and areas unique to the region (e.g., Northrup Canyon). The coulee walls rising on the east and west sides of the reservoir enclose and separate Banks Lake from the surrounding agricultural and high desert landscape, giving recreationists, residents, and other users a strong sense of place and isolation. The small incorporated communities on the north and south ends do not detract from the remoteness that is possible at Banks Lake.

Public use varies seasonally, with peak activity and visitation occurring from mid-May through September. Both local residents and people who generally travel 100 to 200 miles use the area. Most out-of-area users are from the Puget Sound (Seattle/Tacoma) area, who are looking for uncrowded recreational opportunities, sunny days, and warm water. The *Banks Lake Visitor Profile and Recreational Use Study* survey conducted in 1998 showed camping, swimming, and fishing to be the area's most popular activities. More than 500,000 persons annually visit Steamboat Rock State Park (SRSP).

Grant County residents generally use the reservoir and surrounding lands during the day, but the lake is a popular overnight destination for visitors from other parts of the state. Grand Coulee Dam, a regional tourist attraction, draws many first-time visitors to the Banks Lake area. Apart from the Grand Coulee Dam Visitor Arrival Center and Lake Roosevelt National Recreation Area, other attractions near Banks Lake log between 7,650 and 45,715 annual visits each. Cumulatively, the area's attractions registered over 2.6 million visitors in 1997 (see table 3-6), about the same as in the preceding years in the decade.

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<sup>3</sup> Labor income includes employee compensation and proprietor income. This figure represents the labor income as modeled by the Implan analysis for Grant County, Washington, using 1998 data.

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A variety of public agencies and private entities currently provide 19 developed recreation areas. These areas are served by a wide range of developed day and overnight recreation sites and facilities, and generally are concentrated at the south and northeast ends of the reservoir.

While much of the recreation use is concentrated at developed recreation sites, either managed directly by the state (e.g., Steamboat Rock State Park), under lease from the state (e.g., Sunbanks Resort, Coulee Playland), or under lease from Reclamation (e.g., Coulee City Community Park) a significant amount of dispersed use occurs in undeveloped areas along the lake's shoreline.

**Table 3-6.—Visitation to Grand Coulee/Banks Lake area, FY 1997.**

<b>Facility</b>	<b>Visitors</b>
Grand Coulee Dam Visitor Arrival Center	467,347
Lake Roosevelt National Recreation Area	1,462,820
Steamboat Rock State Park	583,496
Crown Point Vista	45,715
Roosevelt Recreation Enterprises Houseboat Rentals	13,559
Coulee Playland Resort	20,000
Colville Tribal Museum	12,179
GCDCA Chamber of Commerce	13,231
Coulee Dam Visitors Center	7,650
Dry Falls Interpretive Center	17,542
<b>Total</b>	<b>2,643,539</b>

Source: Grand Coulee Dam Area Chamber of Commerce, 1998

### **Land-Based Recreation**

Land-based recreation activities include both developed and dispersed camping, bank fishing, sunbathing, hunting, off-road vehicle (ORV) riding, picnicking, hiking, bicycle and horseback riding, nature study (wildlife and wildflower observation), sightseeing, and photography. Of these, camping and hunting are the most popular.

Recreation use survey respondents ranked camping as the most important and common recreation activity at Banks Lake. Overnight opportunities include fully developed recreational vehicle (RV) and tent sites, as well as dispersed, informal campsites. Full-service

RV utility sites and formal tent sites are provided at Coulee City Community Park, Steamboat Rock State Park, Coulee Playland, and Sunbanks Resort. The Jones Bay, Osborn Bay SW, and Dry Falls campgrounds offer a range of developed facilities (e.g., vault toilets, fire rings, picnic tables, and pedestal grills), but no RV utility hookups.

While much of the recreation use is concentrated at developed recreation sites, a significant amount of dispersed use occurs in undeveloped areas along the lake's shoreline. The most popular dispersed camping areas occur in the following general locations: southeast Banks Lake south of the Million Dollar Mile North Boat Launch, Kruk's Bay/Airport Bay, Osborn Bay, Barker Flat, Old Devils Lake/Lovers Lane, and along the Steamboat Rock peninsula's west shore. These areas are accessed primarily by the area's primitive road system and/or by boat. In 1998, 56 heavily used, dispersed campsites were inventoried.

Located on Reclamation lands northwest of the Banks Lake Golf Course and east of the airstrip, the ORV area encompasses 130 acres and contains an ORV track and archery range. The archery range consists of several scattered hay-bale-mounted targets and a small parking pullout.

### **Day Use Activities**

Many developed and dispersed day use opportunities exist at Banks Lake. Developed picnic sites and playgrounds are offered at Coulee City Community Park, Steamboat Rock State Park, Coulee Playland, and Sunbanks Resort. Day use activities include fishing, boating, sun bathing, hiking, ORV and horseback riding, bicycling, archery, model airplane flying, sightseeing, water skiing, scuba diving, wind surfing, personal water craft (e.g., jet skis), rock climbing, wildlife observation, cross country skiing, showshoeing, and ice fishing. Golfing is available at the Banks Lake Public Golf and Country Club.

Hunting begins in September with the opening of dove season and extends through mid-March. The general hunting season for mule deer, white tail deer, upland birds, and waterfowl begins in October. Upland game birds include quail in the brushy draws; chukar in hilly, rugged terrain; and Hungarian partridge and Canada geese in the stubble agricultural fields. Duck hunting is popular on Banks Lake and in the region's small potholes and lakes. Mule deer can be found in the sagebrush-covered flats and draws surrounding the Grand Coulee.

Nature study, wildlife watching, and hiking are increasingly popular activities. The Banks Lake area supports a variety of wildlife observation opportunities, trails, scenic vistas, and unique plant communities (e.g., Northrup Canyon Natural Area) for study. Migratory and resident birds include great blue herons, white pelicans, sandhill cranes, hawks, long-horned owls and bald eagles. Mammals like deer, beaver, muskrat, and rabbit are abundant. There

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are constructed trails in the Steamboat Rock State Park Recreation Area, which includes the Northrup Canyon Natural Area and Steamboat Rock, and at Sunbanks Resort (a WDNR leased facility).

### **Water-Based Recreation**

At full pool, the reservoir surface covers approximately 27,400 acres and provides approximately 82 miles of shoreline. The reservoir offers excellent opportunities for water-based activities such as boating, fishing, water skiing, personal water craft (PWC) riding, wind surfing, and swimming. The highest concentration of boating activity occurs in the Devil's Punch Bowl, Osborn Bay, Kruk's Bay/Airport Bay, and Jones Bay areas. The reservoir surface is open to motorized boating with few restrictions.

User fees are required at the three boat launch sites managed by the SPRC (see table 3-7). A charge of \$5 is assessed at the SRSP Day Use Area and Boat Launch and Steamboat Rock Rest Area and Boat Launch, and a \$5 fee is assessed at the Osborn Bay SW Campground and Boat Launch. Annual, unlimited boat launch permits are available for \$40. Camping fees at SRSP, Coulee Playland, and Sunbanks Resort include use of boat launch facilities. Although launch fees are not required at Coulee City Community Park, a donation box is provided.

No direct user fees are currently required at the six boat launch sites managed by the WDFW. However, state legislation passed in March 1998 requires motor vehicles using marked WDFW access sites to display a current annual fish and wildlife "stewardship decal." The annual fee for the stewardship decal is \$10, but they are issued at no charge to people who buy an annual saltwater, freshwater, combination, small or big game hunting, or trapping license. A fee of \$5 is charged for additional decals if people want to put them on their other vehicles. Failure to display a decal while parked in a WDFW access site could result in a fine. The revenue generated through decal sales is used for access site stewardship and maintenance. Signs are prominently displayed at the WDFW sites where a decal is required.



**Table 3-7.—Boat launch sites and operation and maintenance responsibilities.**

<b>Responsible organization</b>	<b>Boat launch sites</b>
Washington State Parks and Recreation Commission	Osborn Bay Southwest Campground and Boat Launch Steamboat Rock State Park Day Use Area Steamboat Rock Rest Area and Boat Launch
Washington Department of Fish and Wildlife	Osborn Bay Southeast Boat Launch Dry Falls Boat Launch Dry Falls Campground and Boat Launch Barker Flat Campground and Boat Launch * Million Dollar Mile North Boat Launch Million Dollar Mile South Day Use Area and Boat Launch
Sunbanks Resort Lessee	Sunbanks Resort
Coulee Playland Concessionaire	Coulee Playland
Coulee City	Coulee City Community Park

\* No operation and maintenance activities are currently performed by the Washington Department of Fish and Wildlife.

During reservoir drawdowns, rocks and sandbars are sometimes exposed or lie just below the surface, causing the Dry Falls, Million Dollar Mile North and South, Barker Flat, and Osborn Bay SE boat launches to become difficult to use. Launching is reported to increase at the Steamboat Rock Rest Area and Boat Launch during low reservoir elevation periods (Steinmetz 1998).

Swimming is ranked as the second most common activity on Banks Lake. Developed swimming areas are provided and maintained at the SRSP Day Use Area, Coulee City Community Park, Coulee Playland, and Sunbanks Resort. Coulee City Community Park sometimes experiences stagnant water conditions in their swimming area. Consequently, the city is considering the installation of an aeration device or other measures to improve the park's swimming area. Periodically low water levels in the swimming area are also a concern.

Users rank fishing as the second most important and third most common activity in the area. Banks Lake is regarded as one of the finest fishing lakes in the state for bass, perch, and walleye, and offers great fishing opportunities year-round. Popular fishing areas for smallmouth bass are Barker Cove and along the western shore of the Steamboat Rock peninsula; Osborn Bay, Kruk's Bay, Jones Bay, and Devil's Punch Bowl for largemouth bass; and deep water near Barker Flat for walleye and rainbow trout. During the winter season, ice fishing is popular and can last as long as 4 months.

## **Boat Launch Sites**

The WDFW is responsible for the operation and maintenance of six boat launch sites, and the SPRC is responsible for three boat launch sites at Banks Lake (see table 3-7). Operation and maintenance for the other boat launches located on the reservoir (Sunbanks Resort, Coulee Playland, and Coulee City Community Park) are the responsibility of the respective lessee or concessionaire.

## **Irrigated Agriculture**

The CBP currently supplies water for full irrigation of approximately 670,000 acres, but the CBP has been authorized for more than 1 million acres. All water for the CBP is supplied from the Columbia River through Banks Lake with the exception of three small pumped irrigation blocks in the Pasco area. The CBP extends from an area south of Banks Lake to lands south of the confluence of the Snake River with the Columbia. The Columbia River, from Trinidad to Pasco forms the western boundary of the irrigated lands.

Crops grown in the CBP include up to 67 different crops, with alfalfa, potatoes, apples, and vegetables being major contributors to over a half billion dollars worth of crop value each year. Reclamation currently diverts about 2.6 million acre-feet of water from the Columbia River for delivery to irrigators within the CBP. Reclamation utilizes a water right from the State of Washington which the United States holds in trust for the irrigators. It is possible for Reclamation to deliver the capacity of the main canal (10,000 cfs) down to elevation 1537.

## **Historic Resources**

Historic resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archeological, cultural, and scientific importance. There is a legislative and regulatory basis that requires the identification, evaluation, protection, and management of historic resources in Federal undertakings. The following discussion is responsive to the data needs required principally by the National Historic Preservation Act of 1966, as amended. Specific site locations are prevented from disclosure by the Archeological Resources Protection Act (ARPA) of 1979. The latter, and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 define notification and Tribal consultation processes to follow in the event of an inadvertent discovery of human remains of Indian ancestry during an undertaking on Federal lands. It also encourages agencies to have a discovery plan in place where actions will occur in an area that

has the potential for human remains. And finally, it defines a process for agencies to use to determine if recovered human remains are affiliated with federally recognized Tribes and a process for disposition of affiliated remains.

### **Previous Investigations**

In 1947, prior to inundation, Banks Lake was surveyed for archeological sites by the Columbia Basin Archaeological Survey under the direction of the Smithsonian Institution (Drucker 1948). Fifteen sites were recorded in and adjacent to Banks Lake, of which nine are known to be inundated, four are above the flood pool, and the locations of two are uncertain.

Detailed and comprehensive studies of historic resources have occurred recently because of the Banks Lake Resource Management Plan. These are:

- An archeological and historical overview of the upper Grand Coulee (Banks Lake), by Archaeological and Historical Services of Eastern Washington University (Stevens, ed. 1999). The report is a synthesis of the available literature of the span of cultural history for the lands encompassed by the Banks Lake Resource Management Plan.
- An intensive cultural resources survey of Reclamation lands in and around Banks Lake was conducted in 1999 (Hamilton and Hicks 2000). The survey recorded 582 historic properties of various kinds, and includes those sites recorded or mentioned in the previous investigations noted above, as well as certain traditional cultural properties (TCPs). Some TCPs are not included in discussions of historic properties due to confidentiality provisions of the ARPA.

During the fall of 2001, Reclamation lands omitted from the cultural resources survey of Banks Lake cited above were surveyed to have a total historic properties inventory of Banks Lake above 1570 feet. This survey also includes test excavations of several archeological American Indian sites. At the time of this writing, the total number of sites tested and the results of the survey have not been reported; the report is due in the winter of 2002.

Two properties on Banks Lake have been either listed or determined eligible for listing on a historic register: Salishan Mesa and McEntee's Crossing. Salishan Mesa is a complex of cultural features representing multicomponent prehistoric and historic Indian occupations. The site consists of rock alignments and cairns on and between two small mesas, a small rock shelter on the east side of the larger mesa, and a habitation area with at least one housepit near a spring. The site was determined eligible for the National Register of Historic Places in 1987. McEntee's Crossing is listed on the Washington State Inventory of Historic Places and consists of a historic trail and wagon road in Coulee City.

## **Prehistoric Sites**

Sites attributable to American Indian habitation and use predating Euro-American exploration and settlement are numerous and diverse. They represent a variety of uses related to short- and long-term habitation, resource procurement and processing, and rituals, including large habitations, logistical camps, task-specific sites, talus pits, rockshelters, pictographs, cairns, rock enclosures, and mesa-top occupations. As a collection of properties, these sites document a significant settlement system outside of the Columbia River valley proper. Overall, the diversity of site attributes such as artifact density, assemblage structure, and features suggests a complex history of prehistoric use in the coulee. Of the 582 known sites, there are 254 prehistoric sites, and 102 isolated finds recorded from the historic resource investigations (Hamilton and Hicks 2000).

## **Historic Sites**

There are 116 sites and 110 isolated finds related to Euro-American settlement recorded in the Banks Lake area; they range in age from the last quarter of the 19<sup>th</sup> century until the filling of Banks Lake, circa 1950. Historic property types include dumps, homesteads, mines, roads, trails, rock alignments and features, and railroad-related property. The most frequently occurring historic property type is refuse dumps.

## **Traditional Cultural Properties**

A traditional cultural property is a site eligible for inclusion in the National Register when it is associated with cultural practices or beliefs of a living community that are rooted in the community's history and are important in maintaining the continuing cultural identity of the community. Investigations for this category of historic properties occurred during the preparation of the cultural resources overview in 1997, by Camas Consulting. It was not an exhaustive study, however. A number of TCPs were identified in the Banks Lake area; the most obvious and noteworthy is Steamboat Rock, which has frequent references to it in the historical literature as an important legendary site. A recent M.S. thesis by Carmack elucidates the traditional significance of this property (Carmack 2002).

Some TCPs co-occur with archeological sites, while other TCPs may include landscape features, and simple locations. The locations of most TCPs are considered confidential by the ARPA.

## Indian Trust Assets

Indian trust assets (ITAs) are legal interests in property held in trust by the United States for Indian Tribes or individuals. While most ITAs are on-reservation, they may also be found off-reservation. Examples of trust assets include lands, minerals, hunting and fishing rights, and water rights.

The United States has a trust responsibility to protect and maintain rights reserved or granted to Indian Tribes or individuals by treaties, statutes, and executive orders. This responsibility is sometimes further interpreted through court decisions and regulations. This trust responsibility requires that Federal agencies take reasonable actions to protect trust assets when administering programs under their control.

Several American Indian Tribes and bands have interests in this EIS area. Banks Lake from the vicinity of Steamboat Rock southward is in the area ceded in the Yakama Treaty of June 9, 1855. The treaty established the Yakama Reservation and reserved rights and privileges to hunt, fish, and gather roots and berries on open and unclaimed lands to the 14 Tribes and bands who signed that treaty.

The Colville Confederated Tribes, whose reservation was established by Executive Order of April 9, 1872, also considers Banks Lake and surrounding area traditional territory for some of the Tribal members of the twelve confederated Tribes and bands on the Colville Reservation.

Sometimes the government and the Tribes disagree on what is considered to be an ITA, and who holds the right. This document neither judges the validity of, or defines, rights claimed by any Tribal government or member.

While much of the Banks Lake area retains resources that support hunting, fishing, and gathering activities, some areas may have been disturbed to the extent that they no longer can support such traditional uses. Currently, these activities are allowed throughout the study area, except that hunting is not permitted at the existing State Game Reserve and in the State Parks Management Zone.

## Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, dated February 11, 1994, requires agencies to identify and address disproportionately high and adverse human health or environmental effects of their actions

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on minorities and low-income populations and communities as well as the equity of the distribution of the benefits and risks of their decisions. Environmental justice addresses the fair treatment of people of all races and incomes with respect to actions affecting the environment. Fair treatment implies that no group of people should bear a disproportionate share of negative impacts from an environmental action. To comply with the environmental justice policy established by the Secretary, all Interior agencies are to identify and evaluate any anticipated effects, direct or indirect, from the proposed action, or decision on minority and low-income populations and communities, including the equity of the distribution of the benefits and risks.

Table 3-8 shows total population and minority data for Grant County, Washington, and Washington State (U.S. Census Bureau 1990 and 2000). The Hispanic population, a minority ethnic group, was 17 percent of Grant County's total population in 1990, and 30 percent in 2000, compared to 4 percent and 12 percent, respectively, for Washington State. The racial minority population, which includes Black, American Indian/Eskimo/Aleut, Asian/Pacific Islander and persons of another race was 14 percent of Grant County's total population in 1990, and 5 percent in 2000 compared to 8 percent and 14 percent, respectively, for Washington State.

In 1998, the estimate of people of all ages in poverty was 15 percent for Grant County, compared to 10 percent for Washington State.

Although current racial and ethnic data are not available, discussions with those familiar with employment in Grant County revealed a majority of the Hispanic population in Grant County is employed in the agricultural and related sectors.

**Table 3-8.—Total population and minority data for Grant County and Washington State.**

Area	Year	Total	Hispanic	Racial Minority	White
Grant County	1990	54,758	9,427	7,782	46,976
	2000	74,698	22,476	3,339	48,883
Washington State	1990	4,866,692	214,570	557,755	4,308,937
	2000	5,894,122	441,509	800,122	4,652,490

County-level racial and ethnic employment and income data are not available for 2000. Racial and ethnic employment and income data for individual businesses in the county are also not available. Population projections by race and ethnicity and projected racial and ethnic employment and income data for the 50-year period of analysis are not available.

## **Surface Water Quality**

Banks Lake was formed by embankment dams on the north and south ends of the upper Grand Coulee in Central Washington. The capacity of the reservoir is about 715,000 acre-feet, and it is filled by Columbia River water being pumped from FDR Lake into the feeder Canal by electricity generated at Grand Coulee Dam. Initially, only pumps were installed to lift the water into Banks Lake. Later six pump/generators were installed to pump water into Banks Lake and to generate power if the flow was reversed and water flows from Banks Lake back into FDR Lake. Generally, water for irrigation is pumped into Banks Lake and is released through the Bacon Siphon to Billy Clapp Lake on the southern end of the 27-mile long Banks Lake. The average depth of Banks Lake is 41 feet with a maximum depth of 86 feet at full pool of 1570 feet of elevation. The maximum width of the lake is 5 miles, but the average width is considerably less than 5 miles. A ridge in the bottom divides the pool into northern and southern pools. The northern pool is cooler, has less stratification and lower transparency, and more plant nutrients than the southern pool. Mixing of water in the northern pool is greater than in the southern pool because of the reversing flow of the pump/generators. The southern pool has higher biomass, and greater stratification and transparency than the northern pool.

Both of the basins within Banks Lake stratify slightly during the summer months; warmer water develops near the surface and mixes downward from solar heating. Cooler water is pumped into the lake from FDR Reservoir. The cooler water mixes with the slightly warmer upper layers of the lake. This partly mixed lower part of the reservoir is very close to the same temperature below the zone heated by air temperature and the solar radiation. This mixing tends to limit the stratification of the lake in the north basin, so it is less stratified than the southern basin. Neither basin becomes strongly stratified, and solar heating varies almost linearly from the surface to the lower mixed layers, with slightly more heat being accumulated in the near surface than in the deeper parts of the lake. During the fall of the year, the surface of the lake is cooled as the air temperature decreases and the temperature profile becomes nearly uniform as the near surface zone is cooled. However, Banks Lake normally does not mix throughout its depth in most years, and the surface zone can cool until ice forms on the surface during the winter.

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Soils around the reservoir are eroded by wind-driven waves and wakes from boats. The soils are prone to erosion along the west shore of Steamboat Rock peninsula; around both of the boat launch facilities near the Million Dollar Mile; Barker Flat; and Electric City Community Park. Most of the soils are loam, very fine sandy loam, silt loam, sandy loam, or fine loamy sand. The above cited areas are predominately the fine, sandy, or loam type soils. These soils are easily suspended by wave action, and are likely washed and graded along the shorelines in these areas. Erosion along the shoreline and sediment from surface runoff has caused muddy or turbid areas in Banks Lake.

According to water quality standards established by the Administrative Code for the State of Washington, Banks Lake falls under the surface water classification of a “Lake classification.” Lake classification water bodies should support the following beneficial uses:

- Water supply which includes domestic, industrial, and agricultural
- Recreation for primary contact, boating, sport fishing, and aesthetic enjoyment
- Commerce and navigation
- Wildlife habitat
- Fish and shellfish migration, rearing, spawning, and harvesting, and clam, mussel, and crayfish rearing, spawning, and harvesting.

Specific numerical or narrative water quality criteria are established for each water body. The irrigation distribution system of the CBP is also classified under this same classification. An oversight group has recently been established as part of a Memorandum of Understanding (MOU) between Reclamation, Washington State, the Environmental Protection Agency (EPA) and the irrigation districts. The group will work to develop water quality criteria and standards appropriate to Banks Lake based on data, water uses, and information assembled by the group.

CBP water quality data have been collected for nearly 40 years, but few if any data have been collected on Banks Lake. Some data exist for the outlet of Banks Lake, and the Main Canal at Pinto Ridge (1988-1997), and sparse data on FDR Lake were collected from 1992-1997. A few reservoir samples were taken in September 1998 and in 2001 for Banks Lake. These data were reviewed to assess existing conditions for Banks Lake. Data from the lake were typically in the range of 10 to 20 µg/L for phosphorus, which is below the action level of 35 µg/L set by the State for the Columbia Basin area. Temperature at the surface varied from the mid-70s to the low 80s (°F) during August. The water quality criteria are being reviewed under the current MOU between Reclamation, the Washington Department of



Ecology (WDOE), EPA and the water users. Banks Lake is not listed in the current Section 303d report submitted to EPA nor are any maximum contaminate levels (MCLs) exceeded from the Drinking Water Regulations.

## **Groundwater Quality**

The upper aquifer under Banks Lake is the Wanapum unit with a confining interbed called the Wanapum-Grande Ronde. Below the upper confining layer, exists another aquifer called the Grande Ronde. Below these three layers is a bedrock or basement layer. The upper aquifer averages about 400 feet in thickness to the east of Banks Lake, and to the south it varies from a few feet to more than 1,200 feet. The Grande Ronde aquifer is cut off by the basement layer of granite and basalt near Grand Coulee Dam and is about 1,500 feet thick south of the CBP. The average depth of this layer is roughly 1,000 feet under most of the Banks Lake area. Groundwater moves downward near Banks Lake and to the south/ southwest in a horizontal direction from the Columbia River in the Wanapum aquifer. Movement in the Grande Ronde layer is horizontally from the Colombia River in a south/ southwesterly direction and is within the aquifer or upward from the aquifer, because the confining layer forms a basin in the area.

Groundwaters in Washington State are reserved and protected for existing and future beneficial uses. Drinking water is one of the most stringent beneficial uses and is used as the criterion to protect the groundwater for all other beneficial uses. The groundwater quality is a function of the source water, precipitation and the Columbia River, the soils and rock in the aquifers, and the geology of the area. Most of the rocks in the area are of volcanic origin or are weathered volcanic soils. The dissolved solids in most of the area are less than 450 mg/L, suitable for most beneficial uses and according to a 1987 USGS report on the groundwater quality in the basalt units of the Columbia River area (Steinkampf 1989). This report indicated that the primary water types found were calcium-magnesium bicarbonate or sodium bicarbonate.

Banks Lake is very near the main source of groundwater, the Columbia River, which has about 1 mg/L of nitrate-nitrogen in it, and little recharge from agriculture is up-gradient to Banks Lake. The groundwater quality around Banks Lake is not affected by irrigated agriculture, but dry land farming in the area and local sources of nitrogen are affecting nitrogen concentrations in the groundwater. About 20 percent of the domestic and water supply wells sampled in the Columbia Basin have nitrate-nitrogen above the 10-mg/L MCL for drinking water. However, in the immediate area of Banks Lake only one set of wells had any nitrate-nitrogen above 10 mg/L. Data from the Washington State Interagency Ground Water Committee (Cook 1996) report only the wells at Coulee City RV Park exceeded the

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10-mg/L MCL for nitrate; values of 17.7 and 23.4 mg/L were observed. The source of the contamination is unknown, but poor well design and construction are likely contributors for shallow and uncased wells. All other wells near Banks Lake had nitrogen concentrations ranging from 0.38 to 5.9 mg/L with a mean of 1.9 mg/L. Both the WSIGWC (Cook 1996) and USGS (Steinkampf 1989) reports indicate that most public water supply wells are from deep wells that are isolated from any surface or shallow sources of nitrogen. These data show that nitrate-nitrogen is not a public health concern at this time. Some pesticides at very low concentrations have been detected in the groundwater around Banks Lake, but none of them exceeded MCLs established for them.

## **Native American Sacred Sites**

Sites that are important to American Indian religions and considered sacred form a separate resource category, which may relate to other resources, including historic resources and Indian Trust Assets, and in some cases natural resources. Executive Order 13007 (May 24, 1996) directs executive branch agencies to accommodate, to the extent practical and not inconsistent with essential agency functions, access to and use of Indian sacred sites by religious practitioners and to avoid adversely affecting the physical integrity of such sites.

During the analysis and data gathering for the Banks Lake RMP, information on sacred sites and related issues was solicited from the Colville Confederated Tribes and Yakama Nation. Steamboat Rock was identified as a site sacred to the Colville Confederated Tribes.

## **Visual Quality**

The Banks Lake area has spectacular scenery, characterized by the basalt cliffs, headwalls, and talus slopes of the upper Grand Coulee that encompass most of the study area. The landscape is further enhanced by a vegetative mosaic of shrub-steppe, mesic shrub, upland forest, and riparian/wetland plant communities. There are scenic views and vistas from recreation areas along the lakeshore, from State Route 155 along the eastern shoreline, and from the lake itself. Basalt landforms, such as Steamboat Rock and Castle Rock, are dominant features and focal points for most views in the north half of the study area.

Scenic quality is one of the attributes that attract visitors to the Banks Lake area. As seen from the reservoir or shoreline, the landscape is largely undeveloped and visually appealing in most areas. The dominant visual elements are natural features such as water, basalt cliffs/coulee walls, granitic outcrops, and shrub-steppe plant communities.

While most of the landscape is undeveloped, there is also clear evidence of human activity.

Visual intrusions and enhancements include urban/residential areas (Coulee City, Electric City, and Grand Coulee); developed recreation areas; dispersed campsites; an ORV area; highways, primary/secondary roads and jeep trails; an airport; gravel/material sites; electric transmission lines; residential subdivisions; and some agricultural lands. This combination of natural elements and cultural modifications provides a pleasing visual setting to most visitors.

Impacts from dispersed recreation, especially dispersed camping and motor vehicle travel, are readily apparent in some areas. Localized impacts in the form of braided, unauthorized “two-track” secondary roads are common, and soil erosion from rutting and gullyng due to wet season travel is prevalent in some areas.

Irrigated and dry land agriculture dominates the landscape in the upland areas located above the reservoir’s coulee headwalls. This landscape has relatively open, uninterrupted views, with dry land and irrigated wheat fields and stubble the most prominent features. Adjacent to the reservoir, Coulee City and Electric City have traditional rural townscapes surrounded by newer suburban development patterns. Agricultural, rural residential areas, and developed recreation areas are considered visual enhancements by most viewers, whereas jeep trails, gravel/material sites, and electric transmission lines are generally considered visual intrusions.

From about 3 miles north of Coulee City, a northbound traveler on State Route 155 will see a semiprimitive, natural appearing landscape enclosed primarily within the basalt walls of the upper Grand Coulee. From this point to Steamboat Rock State Park, there are two recreation viewpoints and few cultural modifications.

Views from Dry Falls Dam located near the southern end of the study area include some distracting elements, including highways, a braided network of unpaved roads and jeep trails, electric transmission lines, breakwater structures and marinas, and other developed recreation facilities that detract from the surrounding rural landscape.

### **Scenic Quality Ratings**

The Bureau of Land Management’s (BLM) visual resource management system was used to classify the area’s visual resources. To rate visual quality, the study area was divided into 13 scenic quality units based on physiographic characteristics such as landform and vegetation. The scenic quality of each unit then was evaluated for seven key factors—landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications—and given a numeric value. These values were totaled to determine the unit’s scenic quality class.

Table 3-9 presents the results of the scenic evaluation. Five units were rated “A” since they clearly possessed “distinctive” landscapes and high scenic quality. Of these, the

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Middle Banks Lake and Upper Banks Lake units received the highest rating, since they are the most primitive and naturally appearing. Of the remaining units, five were rated “B”—“common” landscapes with a variety of interesting visual features, and three were rated “C”—“minimal” landscape beauty. The “C” units had the highest concentration of cultural modifications and visual intrusions present since they are within rural/residential areas or incorporated city landscapes.

**Table 3-9.—Scenic quality ratings, Banks Lake, Washington.**

Rating unit	Scenic quality rating
Dry Falls Dam	B
Coulee City	C
South Banks Lake 2	C
South Banks Lake 1	B
Middle Banks Lake	A
Upper Banks Lake	A
Steamboat Rock	A
Barker Flat	A
Old Devil’s Lake	A
Kruk’s/Jones Bay	B
North Banks Lake	B
Osborn Bay	B
North Dam	C

## Air Quality

The Banks Lake study area is under the jurisdiction of WDOE’s Eastern Regional Air Pollution Control Authority Office. Washington’s air monitoring network measures ambient air quality near population centers in selected areas of the State. The closest monitoring sites to Banks Lake are Spokane to the east and Yakima to the southwest.

Due to the absence of nearby point sources such as commercial and/or industrial facilities, air quality is high and exceeds the National Ambient Air Quality Standards and criteria.



## **Soils**

Soils in the study area consist of three general soil groups and a total of five general soil map units in Grant County, and three general soil map units in Douglas County. Each of the general soil map units identifies broad areas that have a distinctive pattern of soils, relief, drainage, and landscape. The Grant and Douglas County soil surveys rate suitability for recreation, wildlife habitat, and building site development for each of the 51 soil map units found in the study area.

Soils that pose the most severe risk of erosion are essentially silt loams. Some of these are covered by a mantle of loess and/or subject to periodic flooding. Where these soil types occur, they are excessively slick and easily disturbed by vehicles when wet and become easily airborne when dry. These soil types cover a substantial portion of the study area and often include the same land areas currently used for developed recreation. Where soil compaction accelerates the velocity and volume of surface runoff, the extent and magnitude that soil erosion can occur are increased.

Shorelines erode continually at Banks Lake. Issues of particular concern include the continued loss of riparian vegetation (e.g., black cottonwoods) used as roosting sites by bald eagles and other raptors, and shoreline encroachment on public lands and facilities. Land use activities (e.g., livestock grazing, dispersed recreation, and motor vehicle travel) have accentuated erosion. Other factors that contribute to shoreline erosion include large wakes from boats or wind during high water. The lacustrine soils found along the reservoir shoreline are particularly prone to erosion (Harris 1998). Erosion is prominent along the west shore of the Steamboat Rock peninsula; north and south of the Million Dollar Mile North Boat Launch; south of the Million Dollar Mile South Boat Launch; Barker Flat; and Electric City Community Park (Coulee Playland).

## **Social Environment**

A description of the location, population, income and employment of the affected area appears in the economics section of this draft EIS. A description of the minority and low-income population is included in the environmental justice section of the draft EIS. Social values are identified here.

Comments heard at the public scoping meeting and received in written comments reflect the social values of those directly or indirectly associated with Banks Lake. Different individuals and groups have their own views of Banks Lake, which reflect their social values; such as viewing the lake as an integral part of their business and local economy, a place for water-based recreation, a storage facility for irrigation water and/or power production, or a

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source of water to help anadromous fish. Many individuals expressed concern that negative impacts to their local communities associated with any drawdown would be greater than positive benefits to anadromous fish elsewhere. Others countered that providing increased water for endangered salmon runs would outweigh any negative impacts to everything else.

The social values of these individuals and groups have likely changed over time. It is probable they will continue to change during the 50-year period of analysis. However, it is not possible or appropriate to predict how they will change.